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A Utilization Analysis of Maternal and Newborn Health Service in Alberta (1997/1998 to 1999/2000)

Final Report

By:

Corrine Truman, Ph.D.

Marilyn MacGillivray, B.Admin.

Yan Jin, M.A.

David Johnson, M.D., S.M., M.B.A.

December, 2001

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ACKNOWLEDGEMENT

The authors gratefully acknowledge the support provided by the Alberta Centre for Health Services Utilization Research, which conducts studies of how health services are used and delivered to inform health policy development and management of health service delivery. The Alberta Centre for Health Services Utilization Research is a joint initiative between the University of Alberta and the University of Calgary, funded by Alberta Health & Wellness. *The opinions and conclusions expressed in this paper are those of the authors and no endorsement by Alberta Health & Wellness is implied.*

The authors also wish to thank Alberta Health & Wellness for use of its administrative health services data.

The authors would like to acknowledge the contribution made by three Alberta Health and Wellness employees towards the completion of this document.

- Shirley Groenen, Health Record Planner, Health Information Branch, Health Accountability.
- Tom DeBeyer, Data Warehouse Consultant, Information Technology Branch, Health Accountability.
- Dr. Donald Schopflocher, Biostatistician, Population Health Division.

We would also like to thank the Health Surveillance Branch for their assistance in helping to create the figures and maps used throughout the document.

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TABLE OF CONTENTS

Project Background 1
The Utilization Analysis Process 2
STEP 1 – DEFINING THE UTILIZATION ANALYSIS QUESTION 2
STEP 2 – DEVELOPING THE ANALYTIC FRAMEWORK 3
STEP 3 - IDENTIFYING AND DEVELOPING UTILIZATION ANALYSIS INDICATORS 4
1. Clinical Relevance 4
2. Soundness 4
3. Feasibility 5
STEP 4 – IDENTIFYING RELEVANT COMPARISON GROUPS – THE UNIT OF ANALYSIS 7
Identifying Residence RHA 11
Identifying Service RHA 11
Grouping RHAs 12
STEP 5 – GAINING ACCESS TO ADMINISTRATIVE DATABASES AND BUILDING THE DATASETS 12
Time Period 13
Datasets 14
Dataset #1 - Deliveries 14
Dataset #2 - Newborns 14
Dataset #3 - Linked Newborn and Delivery Information 15
Dataset #4 – Linked Physician Claim and Delivery Information 15
Dataset #5 - Linked Vital Statistics Birth Registry Information and Delivery Information 16
Denominators 16
STEP 6 IDENTIFYING STATISTICALLY SIGNIFICANT DIFFERENCES 17
Tables 17
Graphs 17
Maps 20
RHAs 20
Additional Service Region Indicator Information 21
Indicator # 1 - Percent of First-Time Mothers Not Attending Antenatal Education 22
Indicator # 2 - Percent of Mothers Receiving No Antenatal Physician Visits 24
Indicator # 3 - Rate of Admission for False Labour 26
Indicator # 4 - Percent of Low Obstetrical Antenatal Risk Mothers Who Deliver Outside Their Home RHA 28
Indicator # 5 - Percent of Residents Who Do Not Deliver at Their Nearest Facility 30
Indicator # 6 - Percent of Deliveries in Type I (Low Volume) Facilities 32
Indicator # 7 - Percent of Deliveries by Low Volume (General Practitioners and Family Practitioners) . 34
Indicator # 8 - Medical Induction Rate 36
Indicator # 9 - Instrumental Birth Rate 38
Indicator # 10 - Episiotomy Rate 40
Indicator # 11 Rate of No Epidural/Spinal Analgesia for Vaginal Delivery 42
Indicator # 12 - Percent of Singleton Infants >=2,500 Grams Delivered Vaginally by Obstetricians 44
Indicator # 13 - Primary Cesarean Section Rate 46
Indicator # 14 - General Anaesthetic Rate for Cesarean Section 48
Indicator # 15 - Percent of Cesarean Sections Performed by General Surgeons or General Practitioners 50
Indicator # 16 - Unattempted Vaginal Birth After Cesarean Section (VBAC) Rate 52
Indicator # 17 - Maternal Post Vaginal Delivery Length of Stay Exceeding 48 Hours 54
Indicator # 18 - Percent of Newborns with a One-Minute Apgar Score <7 56

Indicator # 19 - Potentially Preventable Newborn Readmission Rate 58
STEP 7 IDENTIFYING MEANINGFUL PATTERNS 60
Access Indicators 61
Appropriateness Indicators 62
Efficiency Indicators 63
Capability Indicators 64
Effectiveness Indicators 65
Potential Utilization Improvement Priorities for the Provision of Maternal & Newborn Care by Residence RHA 66
STEP 8 – COMMUNICATING RESULTS 68
Appendices 69
Appendix A – The Utilization Improvement Cycle 70
Utilization Review 70
Utilization Analysis 71
Utilization Management 71
Utilization Monitoring 72
Appendix B – Explanation of Terms 73
Appendix C – Additional Tabular Information 74
Appendix D - Methodology Compendium 82
Indicator #1-Percent of First-time Mothers Not Receiving Antenatal Education 82
Indicator # 2-Percent of Mothers Receiving No Antenatal Physician Visits 82
Indicator # 3-Rate of Admission for False Labour 83
Indicator # 4- Percent of Low Obstetrical Antenatal Risk Mothers Who Deliver Outside Their Home RHA 84
Indicator # 5-Percent of Residents Who Do Not Deliver at Their Nearest Facility 85
Indicator # 6-Percent of Deliveries in Type 1 (Low Volume) Facilities 86
Indicator # 7-Percent of Deliveries by Low Volume Providers (General Practitioners or Family Practitioners) 88
Indicator # 8-Medical Induction Rate 88
Indicator # 9-Instrumental Birth Rate 89
Indicator # 10-Episiotomy Rate 90
Indicator # 11-Rate of No Epidural/Spinal Analgesia During Labour for Vaginal Deliveries 91
Indicator # 12-Percent of Singleton Infants > 2,500 Grams Delivered Vaginally by Obstetricians 92
Indicator # 13-Primary Cesarean Section Rate 93
Indicator # 14-General Anesthesia Rate for Cesarean Section 94
Indicator # 15-Percent of Cesarean Sections Performed by General Surgeons or General Practitioners 94
Indicator # 16-Unattempted VBAC Rate 95
Indicator # 17-Percent of Vaginal Deliveries of Singletons (>=2,500 Grams) in Which the Mother's Length of Stay Post-Delivery Exceeded 48 Hours 96
Indicator #18 - Percent of Newborns with a One-Minute Apgar Score < 7 97
Indicator # 19-Potentially Preventable Newborn Readmission Rate 98
Appendix E - Facility Listing By Type 100
Appendix F Indicator and Denominator Information 103
Biographies 122
Corrine Truman 122
Marilyn MacGillivray 123
Yan Jin 124
David Johnson 125
References 126

TABLE OF FIGURES AND TABLES

Figure 1 Participating RHAs 1
Figure 2 Maternal and Newborn Continuum 3
Table 1 – Scoring System Used to Assess the Clinical Relevance, Soundness and Feasibility of the Utilization Analysis Indicators 5
Table 2 – Maternal and Newborn Utilization Analysis Indicators 6
Figure 3(a) Constructing Residence-based Delivery Indicators 7
Figure 3 (b) Constructing Service-based Delivery Indicators 8
Table 3 Delivery Self-Sufficiency Index for 1997/98, 1998/99 and 1999/00 9
Table 4 – Maternal and Newborn Utilization Analysis Indicators Created by Residence and Service RHA 10
Figure 4 Time Period for Which Data was Extracted From Each Database 13
Figure 5 Graph Interpretation Illustration 17
Figure 6 Map and Graph Colour Scheme 18
Figure 7 Sample Graph 19
Figure 8 Sample Map 20
Figure 9: Map and Graph Colour Scheme 60
Figure 10 Access Indicators 61
Figure 11 Appropriateness Indicators 62
Figure 12 Efficiency Indicators 63
Figure 13 – Capability Indicators 64
Figure 14 Effectiveness Indicators 65
Figure 15 Potential Utilization Improvement Priorities for the Delivery of Maternal and Newborn Care by Region of Residence 67
Figure 16 The Utilization Improvement Cycle 70
Table C1 Number of Deliveries (MPS=51) by Type and Number of Newborns (MPS=54) by Residence RHA During 1997/98, 1998/99 and 1999/00 74
Table C2 Number of Deliveries (MPS=51) by Age Group and Residence RHA at Time of Delivery During 1997/98, 1998/99 and 1999/00 75
Table C3 Number and Percent of Deliveries (MPS=51) by Parity* by Residence RHA During 1997/98, 1998/99 and 1999/00 76
Table C4 Number and Percent of Multiple Births by Residence RHA During 1997/98, 1998/99 and 1999/00* 77
Table C5 Number and Percent of Deliveries in Which the Mother had Diabetes (Gestational or Pre-existing) or Hypertension by Residence RHA in 1997/98, 1998/99 and 1999/00 78
Table C6 Number and Percent of Low Birth Weight (LBW) Newborns (<2,500 Grams) by Residence RHA During 1997/98, 1998/99 and 1999/00 79
Table C7 Number and Percent of Mothers Who Delivered by Aboriginal Treaty Status and Low Socioeconomic Status by Residence RHA During 1997/98, 1998/99 and 1999/00* 80
Table C8 Number and Percent of Mothers Who Delivered by Marital Status at the Time of Birth by Residence RHA During 1997/98, 1998/99 and 1999/00* 81
Table F1 Percent of First-time Mothers Not Attending Antenatal Education 103
Table F2 Percent of Mothers Receiving No Antenatal Physician Visits 104
Table F3 Rate of Admission for False Labour 105
Table F4 Percent of Low Obstetrical Antenatal Risk Mothers Who Deliver Outside Their Home RHA 106
Table F5 Percent of Residents Who Do Not Deliver at Their Nearest Facility 107
Table F6 Percent of Deliveries in Type 1 (Low Volume) Facilities 108
Table F7 Percent of Deliveries by Low Volume General Practitioners/ Family Practitioners 109
Table F8 Medical Induction Rate 110

Table F9 Instrumental Birth Rate 111
Table F10 Episiotomy Rate..... 112
Table F11 Rate of No Epidural/Spinal Analgesia for Vaginal Delivery..... 113
Table F12 Percent of Singleton Infants >= 2,500 Grams Delivered Vaginally by Obstetricians..... 114
Table F13 Primary Cesarean Section Rate 115
Table F14 General Anaesthetic Rate for Cesarean Section..... 116
Table F15 Percent of Cesarean Sections Performed by General Surgeons or General Practitioners 117
Table F16 Unattempted Vaginal Birth After Cesarean Section (VBAC) Rate 118
Table F17 Maternal Post Vaginal Delivery Length of Stay Exceeding 48 Hours..... 119
Table F18 Percent of Newborns With a One Minute Apgar Score <7..... 120
Table F19 Potentially Preventable Newborn Readmission Rate 121

PROJECT BACKGROUND

This report presents the results of a utilization analysis of maternal and newborn health service provision in Alberta during 1997/98, 1998/99 and 1999/00.

It was completed at the request of five Alberta Regional Health Authorities (RHAs):

- RHA#7 - East Central,
- RHA#8 - Westview,
- RHA#9 - Crossroads,
- RHA#11- Aspen, and
- RHA#12 - Lakeland.

The process used to complete the utilization analysis was developed by Alberta Health & Wellness (Health System Utilization Analysis Branch). For a more detailed description of the utilization analysis process refer to companion document, ***"Utilization Improvement: A Practical Guide to the Process"***.

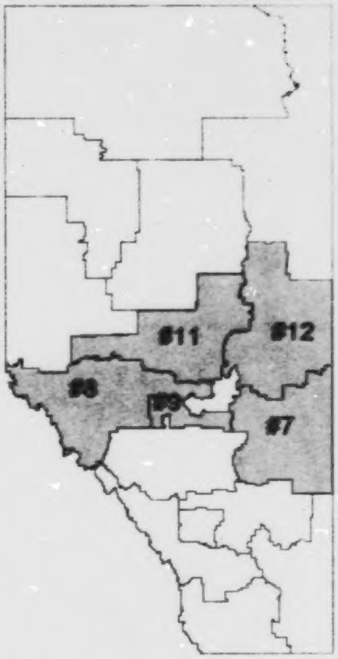


Figure 1 Participating RHAs

Additional information is provided in the attached appendices:

- Appendix A - The Utilization Improvement Cycle,
- Appendix B - Explanation of Terms,
- Appendix C - Additional Tabular Information,
- Appendix D - Methodology Compendium,
- Appendix E - Facility Listing by Type, and
- Appendix F - Indicator Numerator and Denominator Information.

THE UTILIZATION ANALYSIS PROCESS

Utilization analysis is the second part in the four-part utilization improvement process. It involves the identification and development of a set of indicators that can then be used to identify potential areas for utilization improvement. More information about the four-part utilization improvement process can be found in Appendix A. Utilization analysis is completed using an eight-step process:

- **Step 1** defining the utilization question,
- **Step 2** developing the analytical framework,
- **Step 3** identifying and developing utilization analysis indicators,
- **Step 4** identifying relevant comparison groups,
- **Step 5** gaining access to administrative databases and building the datasets,
- **Step 6** identifying statistically significant differences,
- **Step 7** identifying meaningful patterns, and
- **Step 8** communicating results.

STEP 1 – DEFINING THE UTILIZATION ANALYSIS QUESTION

The overall question(s) this utilization analysis addresses is/are:

Do differences exist in the quality of maternal and newborn care provided in Alberta during 1997/98, 1998/99, 1990/00?

And if they do exist....

Are these differences related to health region of residence?

STEP 2 – DEVELOPING THE ANALYTIC FRAMEWORK

The analytic framework developed for the utilization analysis was structured around the continuum of maternal and newborn care (Figure 2.)

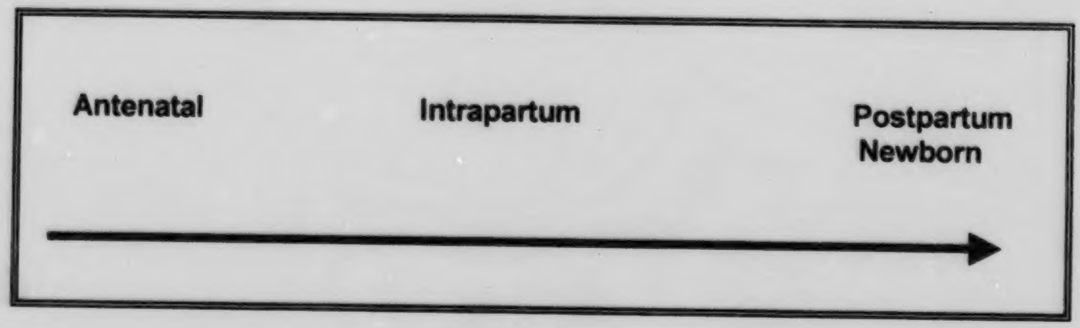


Figure 2 Maternal and Newborn Continuum

It also focused on five quality of care dimensions: accessibility, efficiency, capability, appropriateness and effectiveness.

Accessibility is defined as the ability of residents to obtain healthcare at the right place and the right time irrespective or income, physical location and cultural background.

Efficiency is defined as achieving desired results with the most cost effective use of resources.

Capability is defined as a resident's or region's capacity to provide a health service based on skills and knowledge.

Appropriateness is defined as care/interventions/action provided that is relevant to the resident's needs and based on established standards.

Effectiveness is defined as how care/intervention/action achieves the desired outcome.

STEP 3 - IDENTIFYING AND DEVELOPING UTILIZATION ANALYSIS INDICATORS

Identification and development of the utilization analysis indicators for this study began with a review of the published literature. A Pub-Med internet search was conducted and websites hosted by the Society of Obstetricians and Gynaecologists, Canadian Journal of Rural Medicine, and Canadian Medical Association Journal were visited, as well as, numerous other websites. Current practice recommendations and guidelines for maternal and newborn care were identified and retrieved, and a hand search to identify additional published reports, e.g., the Canadian Perinatal Surveillance System was conducted.

The identified indicators were assessed in terms of clinical relevance, soundness and feasibility. Ideal utilization analysis indicators share these three important characteristics.

1. Clinical Relevance

Clinical relevance relates to the validity and transferability to practice of an indicator.

- **Validity** refers to the extent to which the concept that a service provider is measuring is actually being measured.
- **Transferability** refers to the ability of service providers to understand the utilization analysis results and apply it to their practice.

Because all of the indicators were chosen on the basis of their clinical relevance no relevance score has been included in this study.

2. Soundness

Soundness relates to the ability of an indicator to detect meaningful differences. It is dependent upon the quality of the data used to create the indicator and the frequency of the service event being looked at.

Soundness is influenced by the person who reported or coded the information (self-reported or coded by health records/other health professionals), how well the data field was completed, and whether or not the information was collected for another purpose, e.g., physicians claims. The data element may not have been considered important to the physician billing process and therefore, poorly or inappropriately populated for the intended utilization analysis.

3. Feasibility

Feasibility relates to the availability of the information with which to construct an indicator and the cost in terms of human resources, skills and time to do so.

Feasibility is effected by the complexity of the query and linking process needed to create the indicator.

Areas in which no current indicators were identified were flagged and a process to identify and develop additional potential indicators undertaken.

A final set of maternal and newborn indicators was then identified. Each of the indicators is shown in Table 2. The indicators created for this utilization analysis are identified with an asterisk. Table 2 also includes information about where the indicator fits within the analytic framework developed for the study, as well as our assessment of the soundness and feasibility of the indicator for future use. The scoring system used to make this assessment is shown in Table 1.

Table 1 – Scoring System Used to Assess the Clinical Relevance, Soundness and Feasibility of the Utilization Analysis Indicators

Score	Soundness
1	Less sound
2	Moderate
3	Most Sound

Score	Feasibility
3	Easiest
2	Moderate
1	Most difficult

Table 2 – Maternal and Newborn Utilization Analysis Indicators

#	Continuum	Quality of Care Dimension	Indicator	S**	F**
1	Antenatal	Access	Percent of First-Time Mothers **Not** Attending Antenatal Education	1	1
2	Antenatal	Access	Percent of Mothers Receiving **No** Antenatal Physician Visits	1	3
3*	Antenatal	Efficiency	Rate of Admission for False Labour	3	2
4*	Intrapartum	Efficiency	Percent of Low Obstetrical Antenatal Risk Mothers Who Delivered **Outside** Their Home RHA	2	3
5*	Intrapartum	Efficiency	Percent of Residents Who Did **Not** Deliver at Their Nearest Facility	2	3
6	Intrapartum	Capability	Percent of Residents Who Delivered in Type 1 (Low Volume) Facilities	2	2
7*	Intrapartum	Capability	Percent of Deliveries Provided by Low Volume Practitioners	2	2
8	Intrapartum	Appropriateness	Medical Induction Rate	3	2
9	Intrapartum	Appropriateness	Instrumental Birth Rate	3	2
10	Intrapartum	Appropriateness	Episiotomy Rate	3	3
11*	Intrapartum	Access	Rate of **Non-Use** of Epidural/Spinal Analgesia for Vaginal Delivery	2	3
12	Intrapartum	Capability	Percent of Singleton Infants >= 2,500 Grams Delivered Vaginally by Obstetricians	2	2
13	Intrapartum	Appropriateness	Primary Cesarean Section Rate	3	3
14*	Intrapartum	Access	General Anesthesia Rate for Cesarean Section	3	3
15*	Intrapartum	Capability	Percent of Cesarean Sections Performed by General Surgeons or General Practitioners	2	3
16	Intrapartum	Access	**Unattempted** Vaginal Birth After Cesarean Section (VBAC) Rate	3	2
17	Postpartum	Efficiency	Percent of Maternal Post-Delivery Length of Stays Exceeding 48 Hours	3	1
18	Newborn	Effectiveness	Percent of Newborns with a One-Minute Apgar Score < 7	2	1
19	Newborn	Efficiency	Potentially Preventable Newborn Readmission Rate	2	3

** S=Soundness, F=Feasibility

STEP 4 – IDENTIFYING RELEVANT COMPARISON GROUPS – THE UNIT OF ANALYSIS

The comparison group or unit of analysis selected was **Residence RHA.** Residence-based indicators provide information about services provided to a specific population, in this case an RHA population, regardless of where those services are provided. The decision to use residence RHA as the unit of analysis was made for three important reasons:

1. It is consistent with funding practices. In Alberta, RHAs are funded on a population basis with each RHA being responsible for the care provided to all residents regardless of where those residents receive services.

2. It allows for the calculation of population-based service rates. Service rates cannot be calculated unless the entire population for a geographic region can be accounted for in both the numerator and denominator.

3. It decreases service selection bias. Although RHA populations can and do differ in terms of certain socio-demographic characteristics known to impact health and service use, service populations tend to have a great deal more variance. Different facilities and service RHAs provide different levels of maternal and newborn service and as a result serve very different types of patients making comparison problematic. Residence based indicators help reduce selection bias.

Service-based indicators differ from residence-based indicators in that they provide information about the services provided by specific providers, programs, facilities or RHAs regardless of where the service recipient resides. Figures 3(a) and 3(b) illustrate this difference.

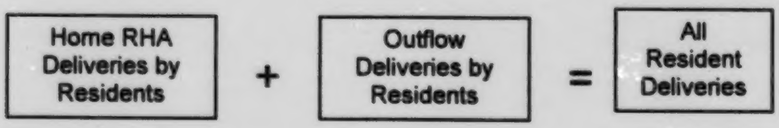

Home RHA Deliveries by Residents
+
Outflow Deliveries by Residents
=
All Resident Deliveries

Figure 3(a) Constructing Residence-based Delivery Indicators

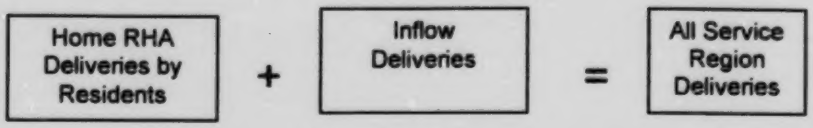

Home RHA Deliveries by Residents
+
Inflow Deliveries
=
All Service Region Deliveries

Figure 3 (b) Constructing Service-based Delivery Indicators

When almost all the residents of an RHA receive almost all of their services in their "home" RHA , residence-based and service-based indicators will be similar. When this occurs, the RHA will have a high self-sufficiency index.

> Self-sufficiency indexes are calculated by dividing the number of services provided to a specific population group in a specific service area by the total number of services provided to the same population regardless of where those services were received. A delivery self-sufficiency index is created by dividing the number of deliveries provided to the residents of each of the provinces 17 RHAs in their home RHA by the number of deliveries provided to the region's residents regardless of where they delivered in Alberta. Self-sufficiency indexes do not take inflow into account.

As table 3 shows the delivery self-sufficiency index during the study period ranged from a high of 99.5% in RHA 4 (Calgary) to a low of 32.0% in RHA 8 (Westview). In other words, almost all RHA 4 residents delivered in their home RHA, whereas only a third of RHA 8 residents delivered in their home RHA.

Table 3 Delivery Self-Sufficiency Index for 1997/98, 1998/99 and 1999/00

Residence RHA	Delivery Self-Sufficiency Index
1	**98.0**
2	**93.0**
3	58.8
4	**99.5**
5	47.9
6	85.9
7	78.7
8	32.0
9	71.3
10	**99.2**
11	46.6
12	66.5
13	**90.4**
14	84.6
15	72.7
16	**96.7**
17	84.3

This means that the residence-based indicators developed for this study for six of the provinces RHAs: 1 (Chinook), 2 (Palliser), 4 (Calgary), 10 (Capital) 13 (Mistahia), and 16 (Northern Lights) will be similar to the rate you would find if you calculated them by service region. This may or may not be the case for the other eleven RHAs in the province. Additional service-region information would be helpful for these RHAs to appropriately identify and target utilization specific management (UI) strategies. An example of how this additional service region information might be used is provided below.

For example:

If you found that the rate of admission for false labour for the residents of RHA X is higher than the provincial average, and you also knew that the self-sufficiency index for RHA X residents is low, you would want to calculate the rate of admission for false labour for RHA X by service region. Who you might wish to target and how you might attempt to create change in relation to this indicator would depend upon the difference you might find between the residence and service rates you calculated for this indicator. If the service region rate is significantly lower than the residence rate you might want to decrease your outflow cost for these services by attempting to *influence how services are provided to your residents outside your RHA. If you found that the service region rate was as high or higher than the residence rate you might want to increase how efficiently you use your acute care beds by decreasing the rate of admission for false labour in your region.*

In this report we have provided additional service information for eleven of the nineteen indicators. Service information has not been included for those indicators in which residents would be expected to access local services (1 & 2), those only meaningful on a residence basis (4, 5 & 6), or those in which we found a definite urban/rural division, making comparisons artificial (7, 12 & 15).

Table 4 – Maternal and Newborn Utilization Analysis Indicators Created by Residence and Service RHA

#	Indicator	Residence RHA	Service RHA*
1	Percent of First-Time Mothers **Not** Attending Antenatal Education	✓	
2	Percent of Mothers Receiving **No** Antenatal Physician Visits	✓	
3	Rate of Admission for False Labour	✓	✓
4	Percent of Low Obstetrical Antenatal Risk Mothers Who Delivered **Outside** Their Home RHA	✓	
5	Percent of Residents Who Did **Not** Deliver at Their Nearest Facility	✓	
6	Percent of Residents Who Delivered in Type 1 Facilities	✓	
7	Percent of Deliveries Provided by Low Volume Practitioners	✓	
8	Medical Induction Rate	✓	✓
9	Instrumental Birth Rate	✓	✓
10	Episiotomy Rate	✓	✓
11	Rate of **Non-Use** of Epidural/Spinal Analgesia for Vaginal Delivery	✓	✓
12	Percent of Singleton Infants >= 2,500 Grams Delivered Vaginally by Obstetricians	✓	
13	Primary Cesarean Section Rate	✓	✓
14	General Anesthesia Rate for Cesarean Section	✓	✓
15	Percent of Cesarean Sections Performed by General Surgeons or General Practitioners	✓	
16	**Unattempted** Vaginal Birth After Cesarean Section (VBAC) Rate	✓	✓
17	Percent of Maternal Post-Delivery Length of Stays Exceeding 48 Hours	✓	✓
18	Percent of Newborns with a One-Minute Apgar Score <7	✓	✓
19	Potentially Preventable Newborn Readmission Rate	✓	✓

*Service indicators do not include those who delivered at Lloydminister General Hospital.

Two important things need to be kept in mind when using service-based indicators:

- When outflow is high, service-based indicators are calculated using a smaller population and as a result there can be greater variation in the estimated value. Combining more than one year of data, as was done in this study, helps to overcome this variation.
- Differences in service-based rates may be due to differences in case mix and not physician/facility practice i.e., a lower cesarean section rate may be due to the fact that most high-risk deliveries take place outside the RHA of residence. Unless a strategy to adjust for case mix differences is used, it can be difficult to explain service rate differences.

Identifying Residence RHA

RHA at service date (not at fiscal year end) was used in this study. Alberta Health & Wellness identifies residence RHA at service date using the patient's residence as reported on the Canadian Institute for Health Information (CIHI) Discharge Abstract Database (DAD) record. All separations in which the residence postal code was missing or reported incorrectly, i.e., could not be matched to the Alberta Health and Wellness postal code cross reference file prepared by Alberta Treasury were excluded from the analysis. A total of 2% (n=2,218) of all MPS 51 (delivery) separations and 2.1% (n=2,364) of all MPS 54 (newborn) separations were excluded due to missing or incorrectly reported postal codes. Delivery and newborn separations provided to Alberta residents in the Lloydminster General Hospital in Saskatchewan have been included for the 1998/99 and 1999/00 fiscal years. This information was not available for the 1997/98 fiscal year.

NOTE: The April 1, 1998 RHA boundaries were used to identify residence RHA. The more recent April 1, 2001 boundaries were announced after the analysis was completed.

Identifying Service RHA

Service RHA was based on facility location.

Grouping RHAs

We also developed three RHA groupings for comparison purposes. **Urban** includes the residents of RHAs 4 (Calgary) and 10 (Capital). **Regional** includes the residents of RHAs 1 (Chinook), 2 (Palliser), 6 (David Thompson), 13 (Mistahia), and 16 (Northern Lights). These five RHAs contain regional hospitals.

Regional hospitals provide secondary level programs and services which require a different level of expertise, equipment and infrastructure, such as medical and nursing specialists, including psychiatrists, obstetricians, pediatricians and medical internists to support programs.

Rural refers to the residents of the other ten RHAs. Central rural refers to the residents of the five RHAs for which this utilization analysis was completed: 7 (East Central), 8 (Westview), 9 (Crossroads), 11 (Aspen) and 12 (Lakeland). South to the residents of RHAs 3 (Headwaters) and 5 (Health Region 5), and north to the residents of RHAs 14 (Peace), 15 (Keeweetinok Lakes) and 17 (Northwestern).

STEP 5 – GAINING ACCESS TO ADMINISTRATIVE DATABASES AND BUILDING THE DATASETS

Three Alberta Health and Wellness administrative health service databases and one Government of Alberta Services* database were used to build the datasets needed to complete the utilization analysis.

1. Canadian Institute for Health Information Inpatient Discharge Abstract Database (CIHI DAD)
2. Alberta Claims Assessment System Database (CLASS),
3. Alberta Vital Statistics Birth Registry Database * (VS), and
4. Alberta Health Insurance Plan Registry Database (AHCIP).

Time Period

In order to make use of the most currently available administrative data and to ensure that the utilization analysis would include enough cases for the residents of some of the smaller RHAs a three-year time period was selected - April 1, 1997 to March 31, 2000.

It is important to note that Vital Statistics information is available for calendar and not fiscal years. Because the 2000 dataset was not available, the information extracted from the vital statistics database does not include the last quarter of the 1999/00 fiscal year (January 1 to March 31, 2000). Figure 4 below illustrates the time periods included in this utilization analysis for each administrative database.

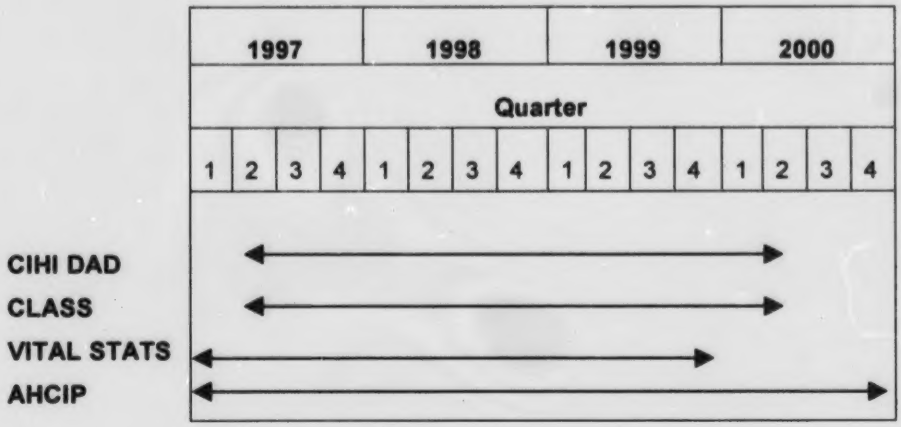


Figure 4 Time Period for Which Data was Extracted From Each Database

Datasets

Five separate datasets were constructed for the utilization analysis using these four administrative databases.

Dataset #1 - Deliveries

Deliveries were identified using CIHI DAD Main Patient Service area (MPS) variable.

> MPS=51 is assigned anytime a patient delivers a baby after admission to the hospital. A baby is defined as a live born or stillborn of 500 grams or more in weight and/or 20 weeks or more of gestation.

All separation information for MPS=51 (obstetrics delivered) for 1997/98 (n=36,340), 1998/99 (n=37,843) and 1999/00 (n=37,589) was extracted (Total n=111,772). Ninety-nine percent of the births that took place in Alberta in 1997, 1998 and 1999 took place in acute care facilities.

Dataset #2 - Newborns

Newborns were also identified using CIHI DAD Main Patient Service area (MPS) variable.

> MPS=54 is assigned to all live births occurring within the reporting hospital. Newborns admitted after the birth (whether a transfer from another facility or born on the way to the hospital is considered to be a one day old infant and is abstracted under MPS=20 (Pediatrics) rather than MPS=54. Stillbirths are assigned to MPS=89.

All separation information for MPS=54 (newborn) for 1997/98 (n=36,680), 1998/99 (n=38,192) and 1999/00 (n=37,963) was extracted (Total n=112,835).

Dataset #3 - Linked Newborn and Delivery Information

A separate dataset was created to add information from the newborn separation (MPS=54) to each respective delivery separation (MPS=51). Because no unique identification variable exists to link delivery and newborn separations in the CIHI databases the Alberta Health Care Insurance Plan (AHCIP) registry file group contract variable was used to create this link (newborns and mothers share the same group contract number). Using this linking strategy 105,923 or 94% of all delivery (MPS=51) and newborn separations (MPS=54) were matched.

Project 311 reporting, which became mandatory as of January 1, 1999, will make the linking process between newborns and mothers easier. The mother's chart number is now recorded on the newborn's abstract record and vice-versa. These variables were not used in this study for January 1999 onward because of the need to use a consistent linking methodology for the entire three-year study period.

Three pieces of delivery information from the newborn separation were added to the corresponding maternal separation record (MPS=51): (1) admission time, (2) admission date, and (3) newborn weight. When the mother delivered more than one newborn (twins, triplets, etc.), additional newborn information was added to the maternal separation.

Dataset #4 – Linked Physician Claim and Delivery Information

A fourth dataset was created to add physician claim (CLASS) information to the delivery separation record. The anonymous scrambled number (ASN) and personal health number (PHN) associated with each delivery separation (MPS=51) was used to associated CLASS billing records for the same individuals. In order to account for time between the service date and the reimbursement claim, all CLASS billing records submitted between April 1, 1997 to September 30, 2000 were queried.

Two pieces of CLASS information were then added to the corresponding delivery separation record: (1) provider speciality, and (2) procedure billed for. Procedure billings in CLASS are coded based on the Canadian Classification of Diagnostic, Therapeutic and Surgical Procedure (CCP-CM) codes.

Dataset #5 - Linked Vital Statistics Birth Registry Information and Delivery Information

A fifth dataset was created to add vital statistics information to the matched MPS=54 and MPS=51 separations (Dataset #3). Because the Alberta Vital Statistics Birth Registry file does not contain any personal health care numbers (PINs), a link between the two datasets was created using five variables: (1) birth date, (2) birth weight, (3) delivery site number, (4) sex, and (5) the mother's age at the time of the birth. All five variables had to be identical in both data sets for a match to take place. A total of 82,405 (78%) of the 105,923 cases in Dataset #3 (previously linked newborn and delivery separations) were matched. If you take into consideration the fact that the Vital Statistics dataset did not contain information for the last quarter of the 1999/00 fiscal year, the percent of matched cases not matched between the two data sets for April1, 1997 to December 31, 1999 increases to 84%.

Three pieces of Vital Statistics information were then added to the matched delivery and newborn records: (1) Apgar score at 1 minute, (2) # of prenatal physician prenatal visits, and (3) mother attended prenatal classes. The residence RHA found in the Vital Statistics file, which is based on a set of special geographic codes, was not added to the file. The residence postal code reported by the mother at the service date contained in the MPS=51 file was used as the geographic residence locator for all five datasets.

Denominators

It is important to note that the denominator for each indicator is not the same. The denominators are dependent upon three things: (1) the dataset used to create the indicator, (2) the number of cases matched, and (3) the number of missing cases. When unmatched and/or missing cases were removed from the denominator, they were also been removed from the numerator.

STEP 6 IDENTIFYING STATISTICALLY SIGNIFICANT DIFFERENCES

In utilization analysis, significant differences can be identified in relation to: (1) the provincial average, (2) best practice benchmarks or guidelines, (3) regional targets, or (4) the rate achieved by the best performer(s) in the comparison group. In this study significant differences were identified in relation to the provincial average. These differences are illustrated using tables, graph and maps.

Tables

Each of the tables show the indicator score by residence as a "point estimate". It is important to keep in mind that point estimates become increasingly unstable as the number of cases in the numerator, the denominator, or both decrease. Or to put it another way, how likely it is that a difference between a point estimate and the provincial average represents a "true" difference is impacted not only by the size of the difference between the scores, but also by the number of cases in the indicator numerator and denominator. Appendix F contains the actual numerator and denominator information for both the residence and service indicators.

Graphs

Individual graphs have also been included for the residence indicators. These graphs can be used to help the reader identify when a difference between each point estimate for the residence score and the provincial rate is likely to indicate a statistically reliable difference. Figure 5 provides an example of the types of information that will allow the reader to do this.

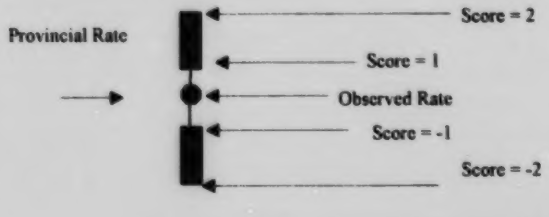


Figure 5 Graph Interpretation Illustration

The black dots in each graph represent the point estimate or the observed rate (as reported in the table multiplied by 100) for each RHA population. The coloured bars above and below each of the black dots represent the range within which the true indicator score is most likely to fall. A larger distance between the top of the upper bar and the bottom of the lower bar represents greater variability in the accuracy of the point estimate.

The end of the bar closest to the black dot represents the value for a standard score of 1 or –1, while the end of the bar farthest from the dot represents the value for a standard score of 2 or –2. A standard score expresses an indicator score in standard deviation units from the mean, and in doing so it allows the reader to visualize where the score falls in relation to the other indicator scores in the distribution. A standard score of 2 can be taken as a good approximation to the 95% confidence interval. Or to put it another way, we can be 95% sure that the true score for the indicator lies somewhere between the top of the upper bar and the bottom of the lower bar. The colour of the bar indicates just how far below or above the provincial average each of the RHA population scores are:

■ significantly higher than the provincial average
▩ higher than the provincial average
□ average
▒ lower than the provincial average
■ significantly lower than the provincial average

Figure 6 Map and Graph Colour Scheme

The position of the individual indicator bars provide an estimate of the difference between individual RHA rates and the provincial average. When the top of one bar overlaps the bottom of another bar the difference between these RHA rates and the provincial average is probably **not** significantly different. If the top of one bar does not overlap with the bottom of another bar a statistical test would probably show that the RHA rates and the provincial average are significantly different.

In the sample graph, each of the RHA populations 1 through 17 are identified on the horizontal axis and the provincial average is represented by the dotted line. Each black dot represents the observed rate for the indicator for an RHA population. The distance between the very top of the top bar and the very bottom of the lower bar is the range within which the observed rate will fall 95% of the time. The observed rate for RHA 1 residents for this indicator is about 0.075, the actual score for the indicator falls between 0.08 and 0.07.

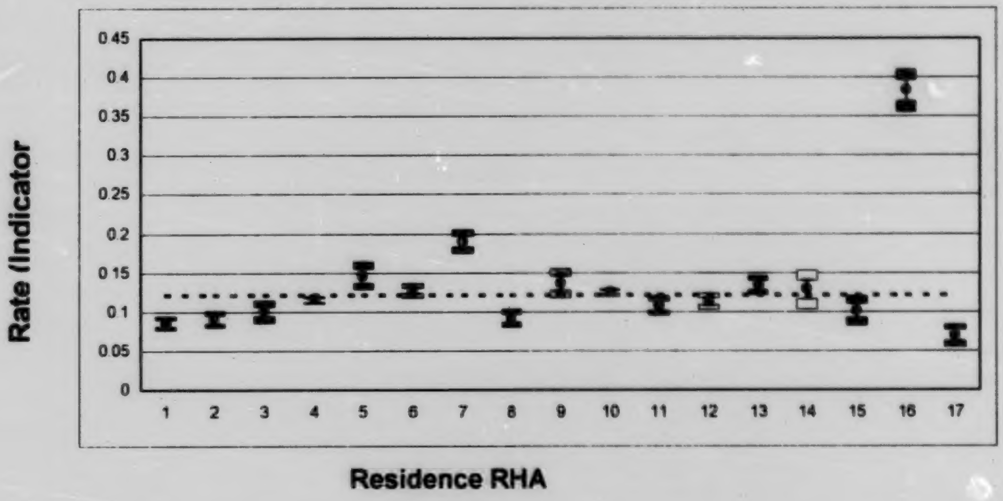


Figure 7 Sample Graph

Figure 7 shows that the score for residents of RHA 1 is significantly lower than the provincial average. This figure also shows that the score for residents of RHA 6 (David Thompson) is not significantly lower than provincial average.

RHA rates should only be compared to the provincial average as no correction for multiple comparisons has been made.

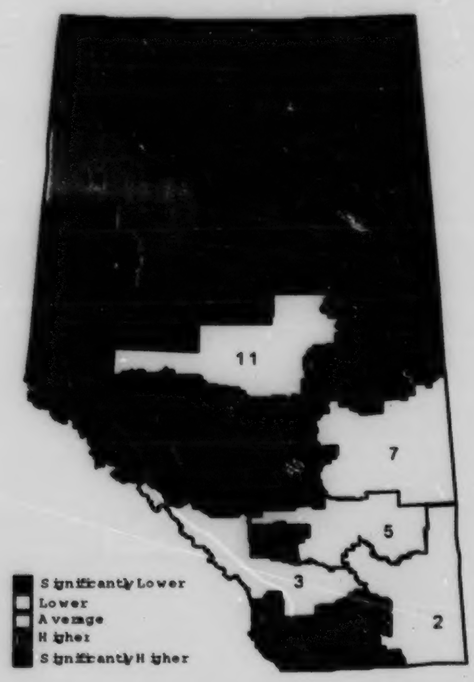
Maps

An RHA map has been included to allow the reader to obtain a quick visual overview of the residence region information presented in the graph. The colours used in the map correspond to the colour of the bars in the graph. The tables

Figure 8 shows that the rate for RHAs 1, 4 and 8 are significantly lower than the provincial average for this indicator.

RHAs 2, 3, 5, 7 and 11 are similar to the provincial average. RHA 14 is higher than the provincial average. RHAs 6, 9, 10, 12, 13, 15, 16 and 17 are significantly higher than the provincial average.

Please see the Alberta Health and Wellness, Health Surveillance, Health Trends in Alberta 2000 document for a more detailed explanation of the mapping methodology.



RHAs

RHA #1	Chinook
RHA #2	Palliser
RHA#3	Headwaters
RHA#4	Calgary
RHA#5	Health Region 5
RHA#6	David Thompson
RHA#7	East Central
RHA#8	Westview
RHA#9	Crossroads
RHA#10	Capital
RHA#11	Aspen
RHA#12	Lakeland
RHA#13	Mistahia
RHA#14	Peace
RHA#15	Keeweetinok Lakes
RHA#16	Northern Lights
RHA#17	Northwestern

Figure 8 Sample Map

Additional Service Region Indicator Information

For eleven of the nineteen indicators (Table 4) additional service region indicator information (point estimates and level of significance in relation to the provincial average) has been added to the table. This information helps identify the appropriate target populations for those RHAs that are significantly above the provincial average. If both the residence and service rates are significantly above the provincial average (red) all regional residents regardless of where they receive services would be targeted. If the residence indicator is not significantly above the provincial average (not red), but the service indicator is (red) then those residents who receive services in their home region would be targeted.

Indicator # 1 - Percent of First-Time Mothers Not Attending Antenatal Education

Type of Indicator*:* Population based - antenatal - access

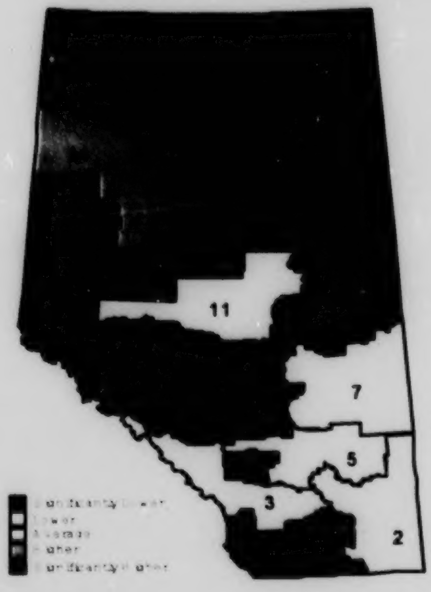
Why is this indicator important?

The purpose of antenatal education is to provide expectant parents with an opportunity to review the mechanisms of labour and birth, to understand obstetrical terminology, the use of tests, medication and pain management, and to explore a variety of other issues. Studies have shown that those who attended antenatal classes use significantly less pain medication during labour and are more satisfied with some aspects of childbirth.[1] The literature suggests that there appears to be a hierarchy among those who attend prenatal education. Older, married and middle-class women attended more frequently than young, unmarried, working class women.[2]

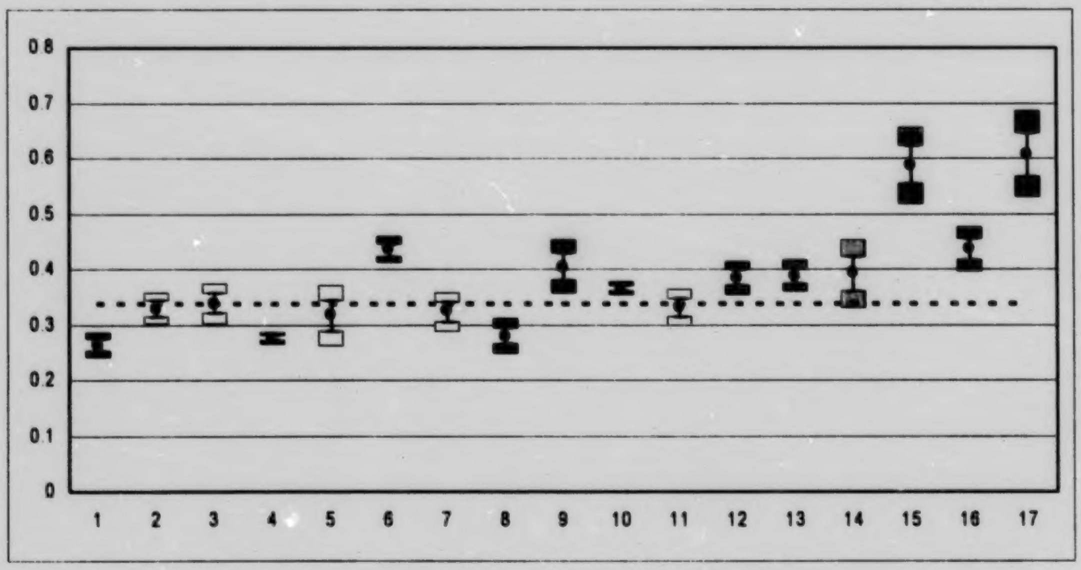
What does this indicator show?

- ✔ The point estimates for this indicator varied from a low of 26.3% to a high of 60.8%, a range of 34.5%.
- ✔ No consistent urban/regional/rural pattern of difference was found.
- ✔ The residents of one urban RHA, 4 (Calgary), were significantly below the provincial average whereas the residents of the other 10 (Capital) were significantly above.
- ✔ One of the five regional RHAs, 1 (Chinook) was significantly above the provincial average, 2 (Palliser) was average, and the remaining three: 6 (David Thompson), 13 (Mistahia) and 16 (Northern Lights) were significantly below.
- ✔ Of the ten rural RHAs: one, RHA 8 (Westview), was significantly below the provincial average, four were average, 3 (Headwaters), 5 (Health Regions 5), 7 (East Central), and 11 (Aspen) and the remaining five were above or significantly above the provincial average.
- ✔ A north/south difference for this indicator did, however, seem to exist. Southern Alberta residents tended to have greater access to antenatal education than did central or northern Alberta residents.

Number and Percent of First-time Mothers Not Attending Antenatal Education by Residence RHA During 1997/98, 1998/99, and the First Three-Quarters of 1999/00


11
7
5
3
2
Significantly Lower
Lower
Average
Higher
Significantly Higher

Residence RHA	
1	26.3
2	32.9
3	33.8
4	27.6
5	31.7
6	43.5
7	32.3
8	28.0
9	40.5
10	36.6
11	33.1
12	38.5
13	38.8
14	39.2
15	58.7
16	43.6
17	60.8
Province	33.8



Indicator # 2 - Percent of Mothers Receiving No Antenatal Physician Visits

Type of Indicator: Population based - antenatal - access

Why is this indicator important?

The goal of antenatal medical care is to assist the pregnant woman in ways that reduce perinatal mortality and morbidity.[3] Antenatal care begins with 'history-taking' and is followed by a complete examination of the patient. The expectant mother receives advice and instructions about her mode of life, diet and regular antenatal check-ups until labour starts. Women who receive antenatal care in early pregnancy, and who have regular antenatal visits tend to have better pregnancy outcomes and lower maternal and perinatal mortality.[1]

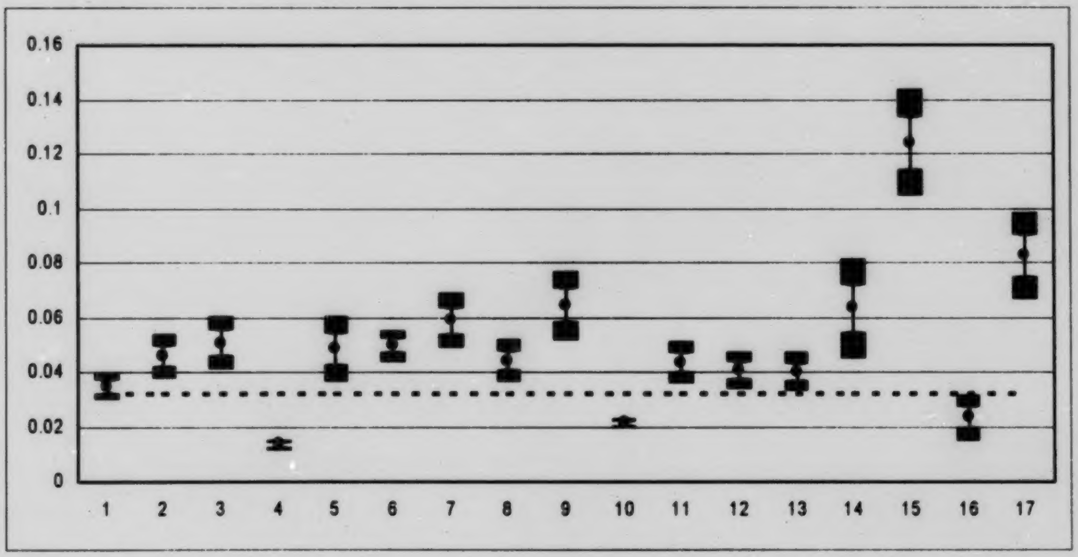
What does this indicator show?

- ✔ The point estimates for this indicator varied from a low of 1.4% to a high 12.4%, a range of 11.0%.
- ✔ An overall urban/ (regional/rural) pattern of difference was found for this indicator.
- ✔ Residents of the two urban RHAs: 4 (Calgary) and 10 (Capital) were significantly below the provincial average, whereas the residents of four of the five regional RHAs and all ten rural RHAs were above or significantly above the provincial average.
- ✔ The rate for RHA 16 (Northern Lights) was similar to that found for 4(Calgary) and 10(Capital).

Number and Percent of Mothers Receiving No Antenatal Physician Visits by Residence RHA During 1997/98, 1998/99 and the First Three Quarters of 1999/00

Significantly Lower
Lower
Average
Higher
Significantly Higher

Residence RHA	
1	3.5
2	4.6
3	5.1
4	1.4
5	4.8
6	5.0
7	5.9
8	4.4
9	6.4
10	2.1
11	4.4
12	4.1
13	4.0
14	6.3
15	12.4
16	2.3
17	8.3
Province	3.2



Indicator # 3 - Rate of Admission for False Labour

Type of Indicator: Population based – antenatal - efficiency

Why is this indicator important?

Admission for false labour is a fairly common occurrence in most labour and delivery units. In Alberta during 1997/98, 1998/99 and 1999/00, 3,016 acute care admissions and 3,492 hospital days were provided for the treatment of false labour. A total of 2.3% of all deliveries during this time period were proceeded by one or more acute care admissions for false labour.

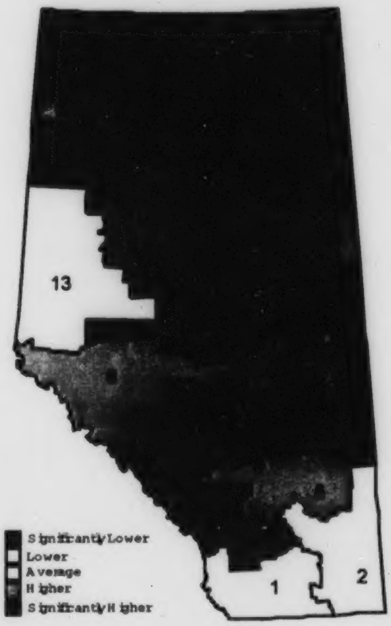
What does this indicator show?

- ✔ The point estimates for this indicator varied from a low of 0.7% to a high of 6.1%, a range of 5.4%.
- ✔ No consistent urban/regional/rural pattern of difference was found.
- ✔ The residents of both urban RHAs: 4 (Calgary) and 10 (Capital), and one rural RHA: 3 (Headwaters) were significantly below the provincial average.
- ✔ The residents of two regional RHAs: 6 (David Thompson) and 16 (Northern Lights) and seven rural RHAs: 7 (East Central), 9 (Crossroads), 11 (Aspen), 12 (Lakeland, 14 (Peace), 15 (Keeweetinok Lakes) and 17 (Northerwestern) were significantly above the provincial average.

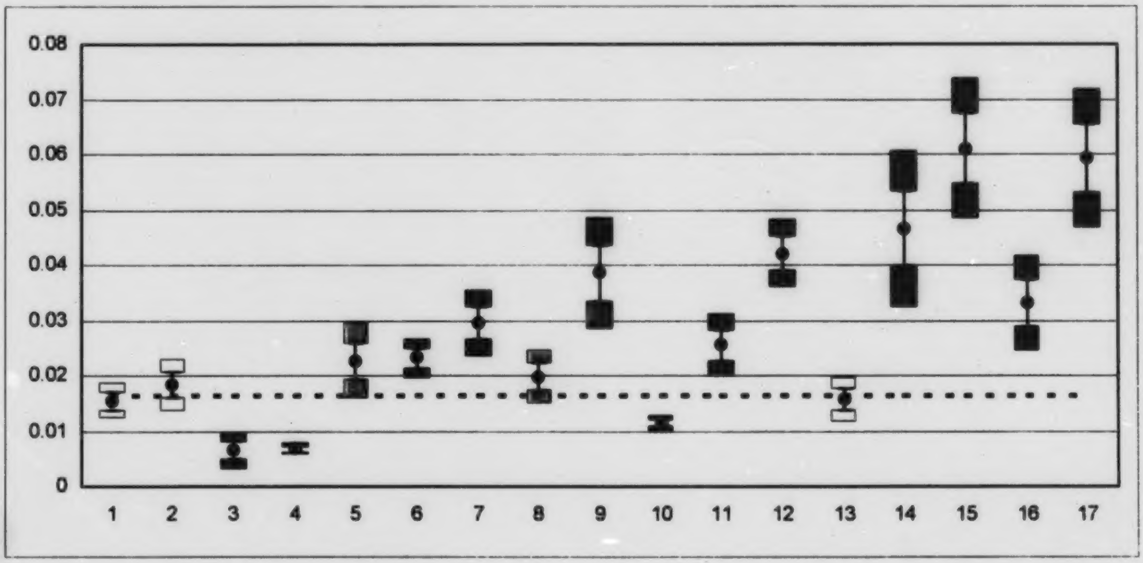
Are the service region indicators different?

Those RHAs that were significantly above the provincial average by residence region also tended to be significantly above the provincial average by service region.

Number of First Separations for False Labour/Total Number of Deliveries for 1997/98, 1998/99 and 1999/00


13
1
2
Significantly Lower
Lower
Average
Higher
Significantly Higher

RHA	Residence RHA		Service RHA	
1	1.6		1.4	
2	1.8		1.9	▨
3	0.7	■	0.5	■
4	0.7	■	0.7	■
5	2.3	▨	2.8	■
6	2.3	■	2.5	■
7	2.9	■	3.3	■
8	2.0	▨	1.1	□
9	3.9	■	3.5	■
10	1.2	■	1.2	■
11	2.6	■	4.6	■
12	4.2	■	5.3	■
13	1.6	□	1.6	□
14	4.7	■	5.8	■
15	6.1	■	6.0	■
16	3.3	■	3.6	■
17	5.9	■	6.7	■
Province	1.6		1.6	



Indicator # 4 - Percent of Low Obstetrical Antenatal Risk Mothers Who Deliver Outside Their Home RHA

Type of Indicator: Population based - intrapartum - efficiency

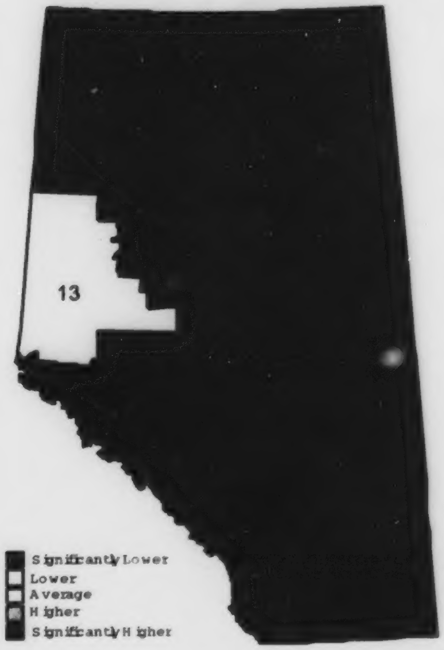
Why is this indicator important?

This indicator was developed for this utilization analysis in an attempt to adjust for a range of antenatal obsterical risk factors (i.e., multiple gestation, malposition and malpresentation of the fetus, cephalopelvic disproportion, and other abnormalities of organs and soft tissues of the pelvis) that may result in referral to a specialist or more specialized facility. Low risk mothers do **not** have any of the above antenatal obstetrical risk factors.

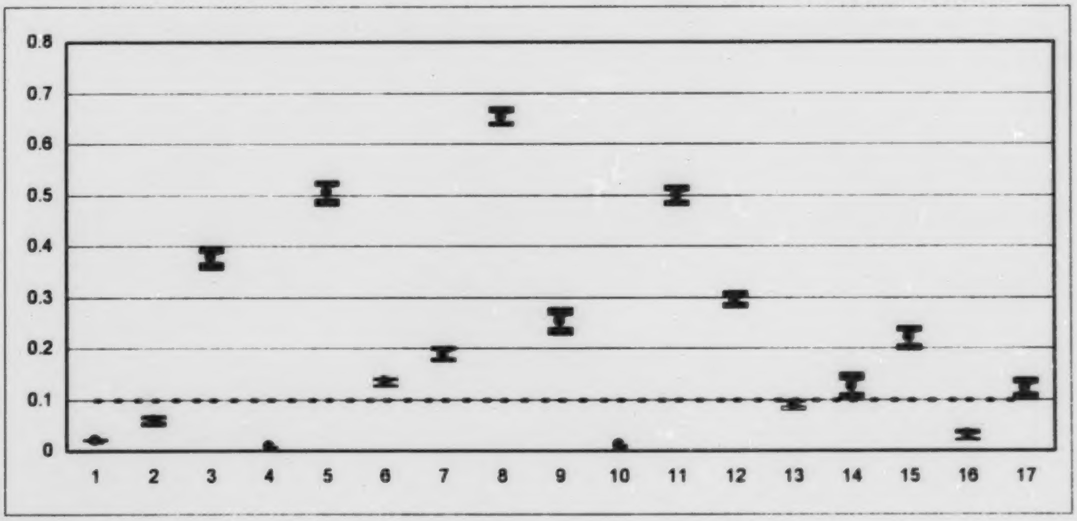
What does this indicator show?

- ✔ The point estimate for this indicator varied from a low of 0.9% to a high of 65.3%, a range of 64.4%.
- ✔ An overall (urban/regional) /rural pattern of difference was found for this indicator.
- ✔ The residents of urban and regional RHAs tended to be significantly below the provincial average, whereas the residents of rural RHAs tended to be significantly above the provincial average.
- ✔ The exception was RHA 6 (David Thompson). The outflow of low obstetrical antenatal risk mothers for David Thompson is significantly different from that found for the residents of the other four regional RHAs: 1 (Chinook), 2 (Palliser), 13 (Mistahia) and 16 (Northern Lights). The pattern for RHA 6 (David Thompson) residents is more similar to that found for rural RHA residents.

Number and Percent of Low Obstetrical Antenatal Risk Mothers Who Delivered Outside Their Home RHA During 1997/98, 1998/99 and 1999/00


13
Significantly Lower
Lower
Average
Higher
Significantly Higher

Residence RHA	
1	1.9
2	5.9
3	37.7
4	0.5
5	50.4
6	13.3
7	18.3
8	65.3
9	25.2
10	0.9
11	50.0
12	29.5
13	8.9
14	12.5
15	21.9
16	2.9
17	12.1
Province	9.9



Indicator # 5 - Percent of Residents Who Do Not Deliver at Their Nearest Facility

Type of Indicator: Population based – intrapartum - efficiency

Why is this indicator important?

Research has shown that women frequently bypass small local hospitals and travel to higher volume facilities that offer a wider range of services to deliver.[4] More research is needed to evaluate how efficient it is to provide services that are not being accessed by the surrounding population. Finding an appropriate balance between service population, service location and service mix is important.

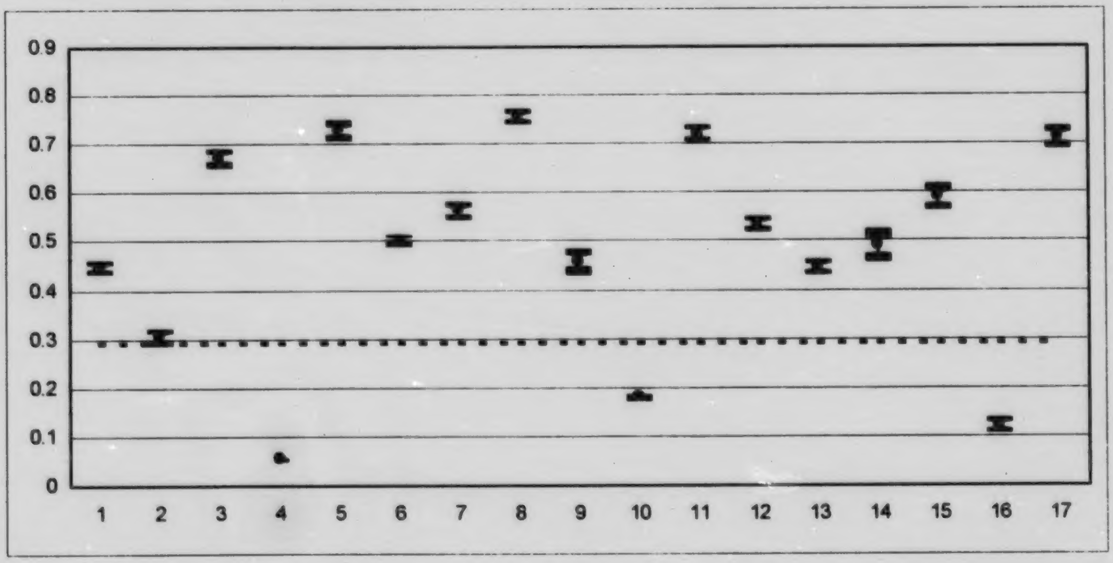
What does this indicator show?

- ✔ The point estimates for this indicator varied from a low of 5.4% to a high of 72.9%, a range of 67.5%.
- ✔ An overall urban/ (regional/rural) pattern of difference was found for this indicator.
- ✔ The residents of the two urban RHAs: 4 (Calgary) and 10 (Capital) were significantly above the provincial average, whereas the residents of regional and rural RHAs tended to be significantly below the provincial average. The exception was RHA 16 (Northern Lights) which was significantly below the provincial average.

Number and Percent of Regional Residents Who Did Not Deliver at Their Nearest Facility During 1997/98, 1998/99 and 1999/00

2
Significantly Lower
Lower
Average
Higher
Significantly Higher

Residence RHA	
1	**44.7**
2	**30.5**
3	**67.2**
4	**5.4**
5	**72.9**
6	**50.3**
7	**56.3**
8	**75.6**
9	**45.9**
10	**17.9**
11	**72.1**
12	**53.5**
13	**44.6**
14	**48.9**
15	**58.9**
16	**12.1**
17	**71.2**
Province	**29.0**



Indicator # 6 - Percent of Deliveries in Type I (Low Volume) Facilities

Type of Indicator: Population based – intrapartum - capability

Why are these indicators important?

Type I facilities are hospitals in which less than 50 births occurred on average per year during 1997/98, 1998/99 and 1999/00. Of the 89 facilities in Alberta in which deliveries took place, 31 were classified as Type I facilities. Please refer to Appendix E for a listing of Type I facilities.

What does this indicator show?

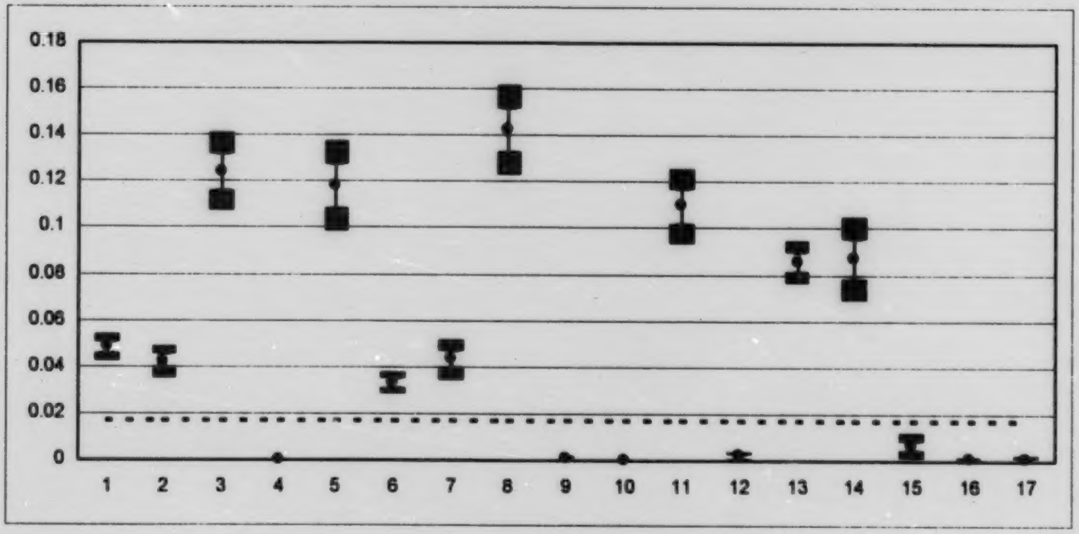
- ✓ The point estimates for this indicator varied from a low of 0.0% to a high of 14.2%, a range of 14.2%.
- ✓ No consistent urban/regional/rural pattern of difference was found for this indicator.
- ✓ Although the residents of both urban RHAs: 4 (Calgary) and 10 (Capital) were significantly below the provincial average, regional and rural regions were either significantly below or significantly above the provincial average.
- ✓ A north/south difference for this indicator did, however, seem to exist for rural residents. More rural southern Alberta residents delivered in Type 1 facilities than did northern rural Alberta residents.

Number and Percent of Deliveries in Type I (Low Volume) Facilities During 1997/98, 1998/99 and 1999/00*

Significantly Lower
Lower
Average
Higher
Significantly Higher

Residence RHA	
1	4.9
2	4.2
3	12.4
4	0.0
5	11.8
6	3.3
7	4.3
8	14.2
9	0.0
10	0.0
11	11.0
12	0.2
13	8.5
14	8.7
15	0.7
16	0.0
17	0.0
Province	1.7

* Does not include deliveries in University Hospital, Edmonton



Indicator # 7 - Percent of Deliveries by Low Volume (General Practitioners and Family Practitioners)

Type of Indicator: Population based – intrapartum - capability

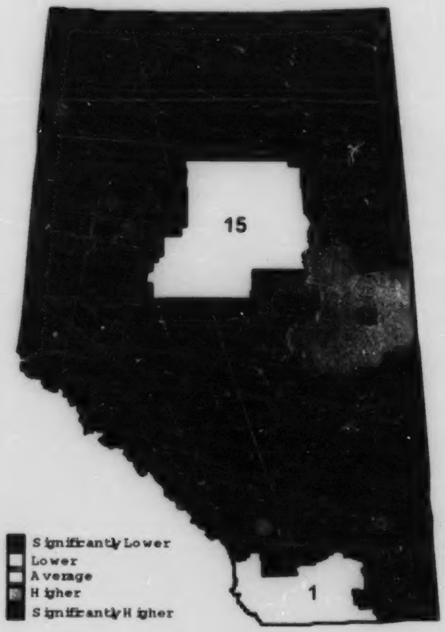
Why are these indicators important?

Although there has also been much debate about the minimum number of deliveries per year needed to maintain competence, the Society of Obstetricians and Gynaecologists have taken the position that those physicians who perform less than 25 deliveries a year should be restricted to low risk obstetrics and update their skills every two to three years.[5]

What does this indicator show?

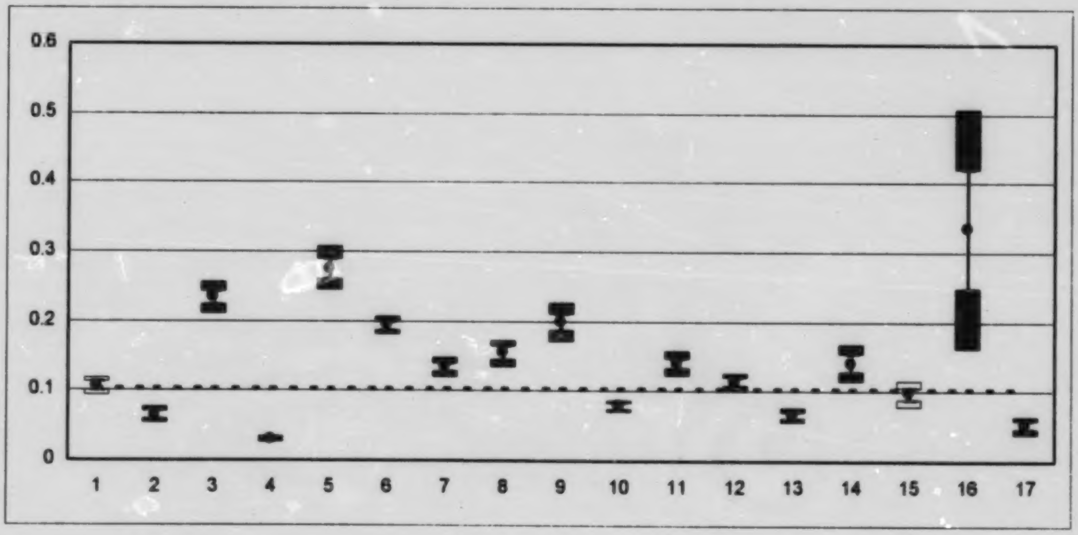
- ✓ The point estimates for this indicator varied from a low of 3.0% to a high of 33.3%, a range of 30.3%.
- ✓ Residents of both urban RHAs : 4 (Calgary) and 10 (Capital) were significantly above the provincial average.
- ✓ No consistent regional/rural pattern of difference was identified. Two of five regional RHAs: 2 (Palliser) and 13 (Mistahia), and one of the ten rural RHAs: 17 (Northwestern) were significantly above the provincial average.

Number and Percent of Deliveries by Low Volume General Practitioners and Family Practitioners During 1997/98, 1998/99 and 1999/00


15
1
Significantly Lower
Lower
Average
Higher
Significantly Higher

Residence RHA	
1	10.6
2	6.5
3	23.4
4	3.0
5	27.6
6	19.4
7	13.4
8	15.5
9	19.9
10	7.8
11	14.0
12	11.4
13	6.7
14	14.1
15	9.8
16	33.3
17	5.2
Province	10.3

*Does not include obstetricians



Indicator # 8 - Medical Induction Rate

Type of Indicator: Population based – intrapartum - appropriateness

Why is this indicator important?

Medical induction is associated with increased risk for instrumental delivery, shoulder dystocia and cesarean section. The rate of induction has almost doubled in the last 15 years.[6] Reducing the rate of medical induction may aid efforts to reduce the primary cesarean delivery rate.[7]

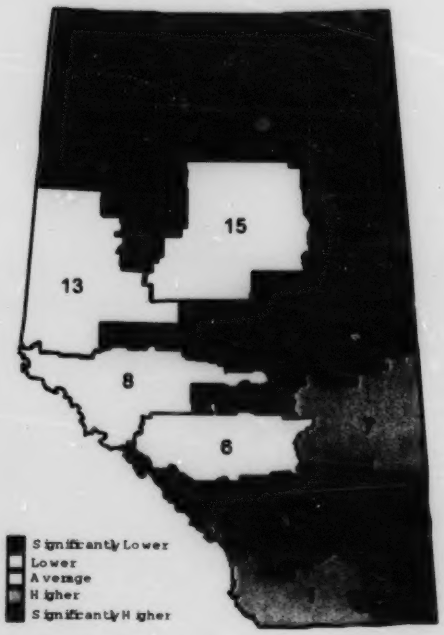
What does this indicator show?

- ✓ The point estimates for this indicator varied from a low of 10.3% to a high of 30.7%, a range of 20.4%.
- ✓ No urban/regional/rural pattern of difference was found for this indicator.
- ✓ RHA 4 (Calgary) was significantly below the provincial average whereas RHA 10 (Capital) was significantly above.
- ✓ Of the regional RHAs: 2 (Palliser) was significantly below the provincial average whereas RHA 16 (Northern Lights was significantly above.
- ✓ Of the rural RHAs: 3 (Headwaters), 5 (Health Region Five), 14 (Peace) and 17 (Northwestern) were significantly below the provincial average, whereas 9 (Crossroads), 11 (Aspen) and 12 (Lakeland) were significantly above.

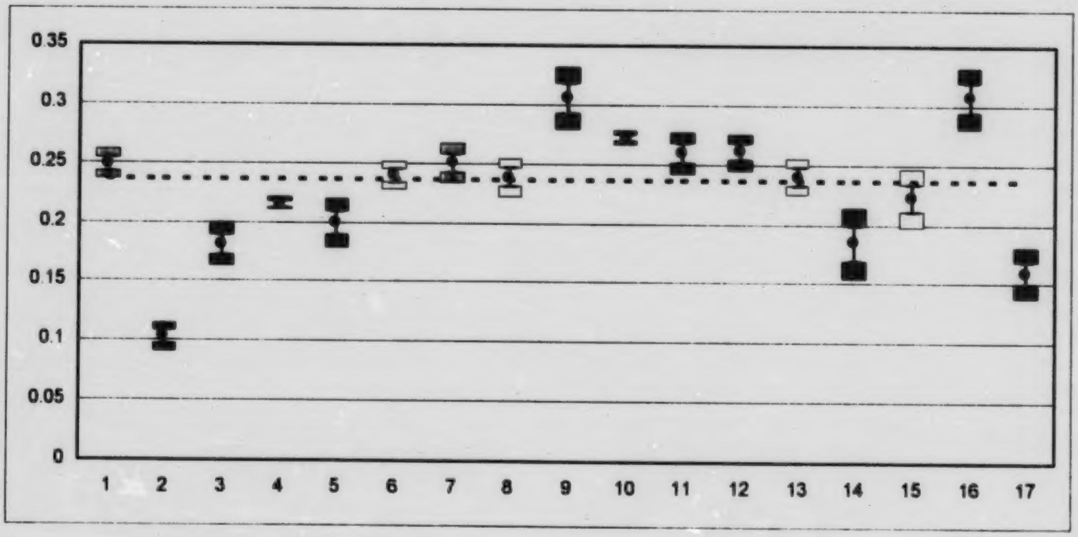
Are the service region indicators different?

Those RHAs that were significantly above the provincial average by residence were not necessarily significantly above the provincial average by service region. Three rural RHAs that were significantly above the provincial average by region of residence (9 (Crossroads), 11 (Aspen) and 12 (Lakeland)) were similar to or significantly lower than the provincial average by service region.

Number and Percent of Vaginal Deliveries with Medical Induction During 1997/98, 1998/99 and 1999/00


15
13
8
6
Significantly Lower
Lower
Average
Higher
Significantly Higher

RHA	Residence RHA		Service RHA	
1	24.8	▨	25.1	■
2	10.3	■	9.6	■
3	18.1	■	11.2	■
4	21.5	■	22.1	■
5	20.0	■	10.4	■
6	24.0	□	24.1	□
7	25.0	▨	21.4	■
8	23.8	□	8.4	■
9	30.6	■	24.7	□
10	27.2	■	28.9	■
11	25.9	■	18.8	■
12	26.1	■	19.4	■
13	24.0	□	23.8	□
14	18.4	■	17.7	■
15	22.2	□	19.6	■
16	30.7	■	31.1	■
17	16.0	■	13.7	■
Province	23.6		23.6	



Indicator # 9 - Instrumental Birth Rate

Type of Indicator: Population based – intrapartum - appropriateness

Why is this indicator important?

Instrumental delivery includes the use of forceps or vacuum extraction. Vacuum extraction is associated with less maternal perineal trauma than forceps.[8] Risks associated with forceps delivery include postpartum infection, cervical laceration, prolonged hospital stays and perineal laceration. [9]

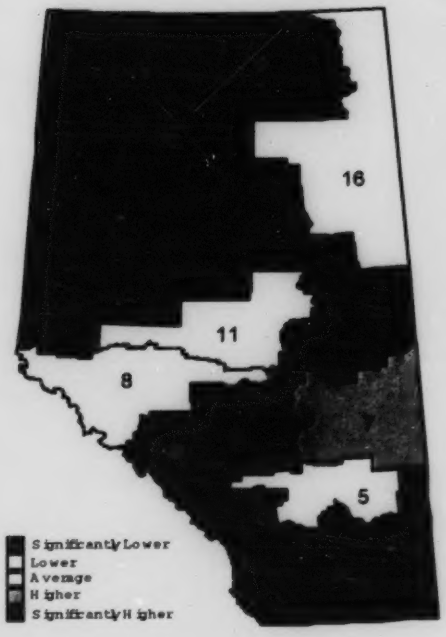
What does this indicator show?

- ✓ The point estimates for this indicator varied from a low of 7.1% to a high of 23.4%, a range of 16.3%.
- ✓ An overall urban / (regional/rural) pattern of difference was found for this indicator.
- ✓ Residents of both urban RHAs: 4 (Calgary) and 10 (Capital) were significantly above the provincial average, whereas the residents of all five regional and eight of ten rural RHAs tended to be significantly below, below or similar to the provincial average.
- ✓ HA 7 (East Central) and 12 (Lakeland) were above or significantly above the provincial average.

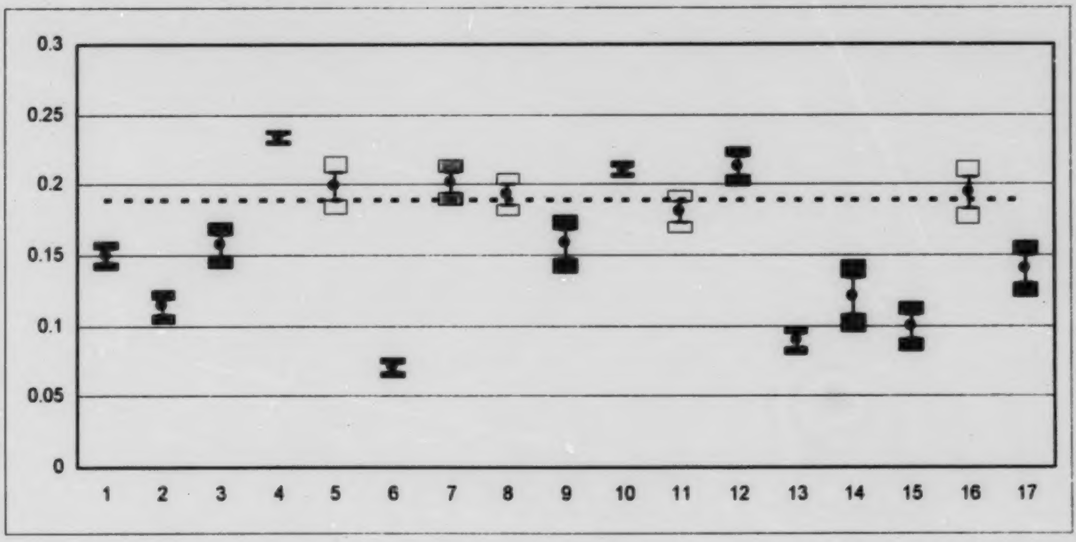
Are the service region indicators different?

Those RHAs that were significantly above the provincial average by residence region also tended to be significantly above the provincial average by service region.

Number and Percent of Instrumental Birth by RHA for 1997/98, 1998/99 and the First Three-Quarters of 1999/00


16
11
8
5
Significantly Lower
Lower
Average
Higher
Significantly Higher

RHA	Residence RHA		Service RHA	
1	15.0	■	14.8	■
2	11.4	■	11.2	■
3	15.7	■	14.3	■
4	23.4	■	23.3	■
5	20.0	□	18.1	□
6	7.1	■	6.4	■
7	20.2	▨	21.2	■
8	19.4	□	19.4	□
9	15.8	■	13.5	■
10	21.1	■	20.9	■
11	18.1	□	15.6	■
12	21.3	■	20.0	▨
13	8.9	■	8.1	■
14	12.1	■	11.0	■
15	10.0	■	8.1	■
16	19.4	□	18.5	□
17	14.0	■	14.8	■
Province	19.0		19.0	



Indicator # 10 - Episiotomy Rate

Type of Indicator: Population based – intrapartum - appropriateness

Why are these indicators important?

Although there is no episiotomy rate benchmark, the practice of routine episiotomy has been questioned.[10] Evidence from randomized controlled trials have shown that avoiding episiotomy actually protects perineal integrity.[11] Physicians who use episiotomy frequently and routinely often do so as part of an interventionist pattern or style of practice.[10]

What does this indicator show?

- ✔ The point estimates for this indicator varied from a low of 9.1% to a high of 50.3%, a range of 41.2%.
- ✔ No consistent urban/regional/rural pattern of difference was found for this indicator.
- ✔ The residents of both urban RHAs: 4 (Calgary) and 10 (Capital), one out of five regional RHAs: 16 (Northern Lights), and two out of ten rural RHAs: 5 (Health Region 5) and 7 (East Central) were significantly above the provincial average.
- ✔ All other regional and rural RHAs were similar to or significantly below the provincial average.

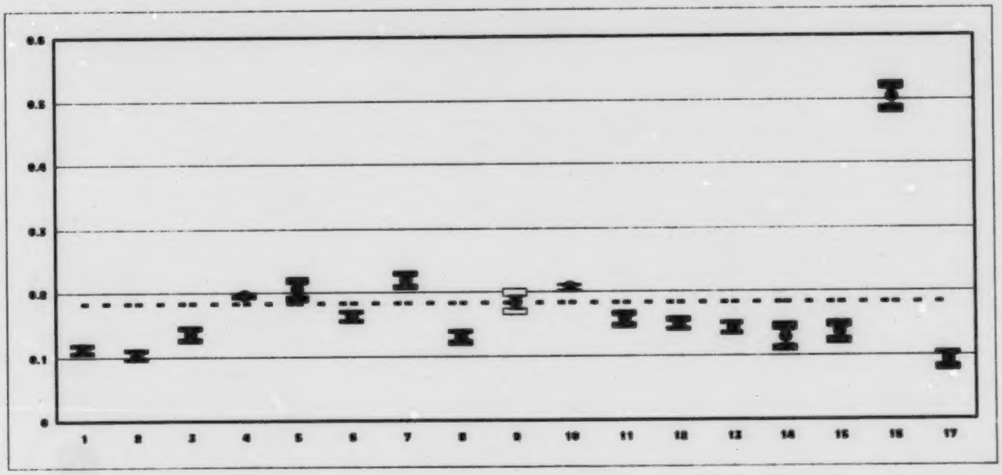
Are the service region indicators different?

Those RHAs that were significantly above the provincial average by residence region also tended to be significantly above the provincial average by service region.

Number and Percent of Vaginal Deliveries in Which an Episiotomy was Performed by Residence RHA for 1997/98, 1998/99 and 1999/00

9
Significantly Lower
Lower
Average
Higher
Significantly Higher

RHA	Residence RHA	Service RHA
1	11.2	11.0
2	10.3	10.6
3	13.5	14.2
4	19.4	19.1
5	20.4	24.2
6	16.2	17.1
7	21.9	22.6
8	13.0	6.9
9	18.4	17.2
10	20.6	19.6
11	15.7	17.7
12	14.9	15.2
13	14.2	14.3
14	12.7	12.9
15	13.5	16.4
16	50.3	45.1
17	9.1	9.9
Province	18.2	18.3



Indicator # 11 Rate of No Epidural/Spinal Analgesia for Vaginal Delivery

Type of Indicator: Population based – intrapartum - access

Why is this indicator important?

Although several types of pain relief in labour have been identified, regional analgesia (epidural & spinal) has been found to be superior to parenteral or inhalation analgesia.[12] [13] In large centres where regional analgesia is readily available to labouring women, about 50% will make use of it.[14] Regional analgesia tends to be less available to women in rural areas and more available to women who deliver in large centres with a base of specialist anesthetists.

What does this indicator show?

- ✔ The point estimates for this indicator varied from a low of 49.3% to a high of 96.8%, a range of 47.5%.
- ✔ No consistent urban/regional/rural pattern of difference was found for this indicator.
- ✔ The residents of both urban RHAs: 4 (Calgary) and 10 (Capital), one regional RHA: 16 (Northern Lights) and one rural RHA: 8 (Westview) were significantly lower than the provincial average.
- ✔ The residents of the other four regional and other nine rural RHAs were significantly above the provincial average.

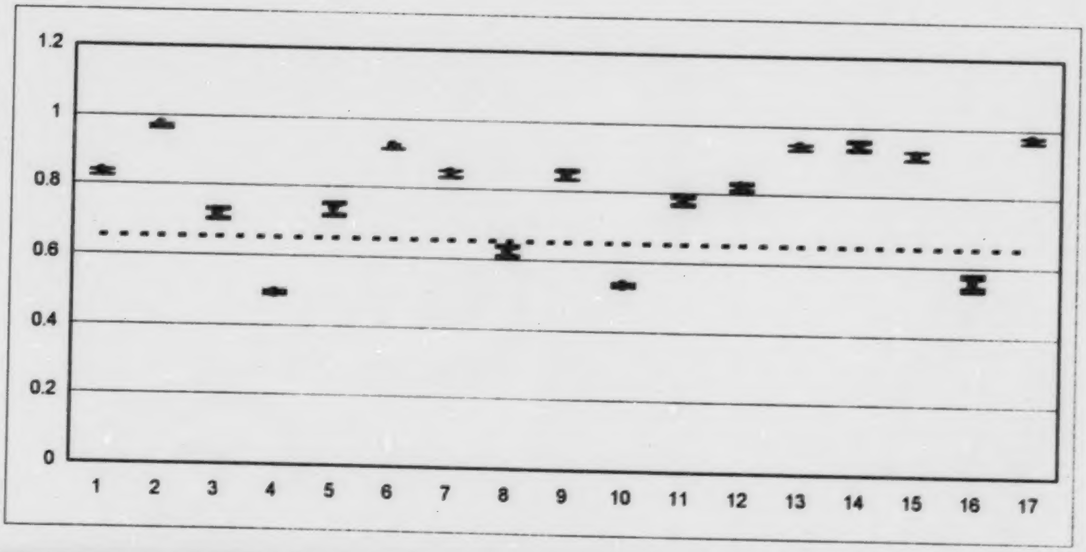
Are the service region indicators different?

Those RHAs that were significantly above the provincial average by residence region also tended to be significantly above the provincial average by service region.

Number and Percent Vaginal Deliveries in Which the Mother Did Not Receive Epidural/Spinal Analgesia During Labour by RHA During 1997/98, 1998/99 and 1999/00

Significantly Lower
Lower
Average
Higher
Significantly Higher

RHA	Residence RHA	Service RHA
1	83.0	85.6
2	96.6	98.5
3	72.0	88.9
4	49.3	56.8
5	73.6	93.3
6	91.9	95.6
7	84.4	90.0
8	62.4	57.5
9	84.7	95.7
10	53.2	60.9
11	77.8	92.0
12	82.1	94.7
13	93.8	97.4
14	94.6	96.6
15	92.0	98.4
16	55.8	66.1
17	96.8	99.6
Province	65.2	70.3



Indicator # 12 - Percent of Singleton Infants >=2,500 Grams Delivered Vaginally by Obstetricians

Type of Indicator: Population based – intrapartum - capability

Why is this indicator important?

Literature has shown that obstetricians who deliver low risk mothers have higher intervention rates of artificial rupture of membranes, induction, augmentation, forceps and vacuum extractions and episiotomy than do general practitioners who deliver low risk mothers.[15] [16] [17]

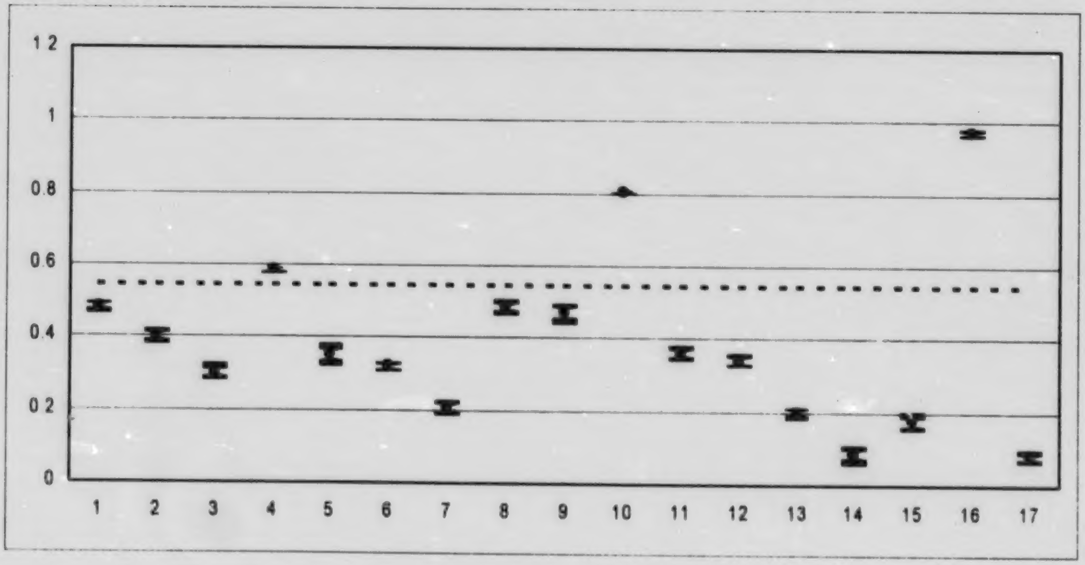
What does this indicator show?

- ✓ The point estimates for this indicator varied form a low of 8.3% to a high of 97.3%, a range of 89.0%.
- ✓ An overall urban/ (regional/rural) pattern of difference was found for this indicator.
- ✓ The two urban RHAs: 4 (Calgary) and 10 (Capital) were significantly above the provincial average.
- ✓ The regional and rural RHAs, with the exception of RHA 16 (Northern Lights) were significantly below the provincial average.
- ✓ RHA 16 (Northern Lights) was similar to the two urban RHAs and was significantly above the provincial average.

Number and Percent of Singleton Infants >=2,500 Grams Delivered Vaginally by Obstetricians

Significantly Lower
Lower
Average
Higher
Significantly Higher

Residence RHA	
1	**48.2**
2	**40.1**
3	**30.3**
4	**58.4**
5	**35.2**
6	**32.1**
7	**21.0**
8	**48.6**
9	**47.0**
10	**80.5**
11	**36.3**
12	**34.3**
13	**19.9**
14	**8.5**
15	**17.7**
16	**97.3**
17	**8.3**
Province	**54.4**



Indicator # 13 - Primary Cesarean Section Rate

Type of Indicator: Population based – intrapartum - appropriateness

Why is this indicator important?

Cesarean sections have not only been associated with increased maternal mortality[18], they also result in increased cost and length of stay.[19 20 21] In 1990, in response to growing concern about the high cesarean section rate, the US Department of Health and Human Services established the Healthy People 2000 Objective to decrease the primary cesarean section rate to 12 or fewer per 100 births. [22]

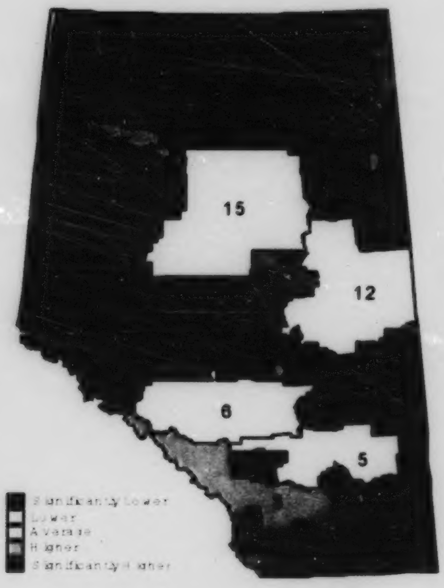
What does this indicator show?

- ✓ The point estimates for this indicator varied from a low of 86.9% to a high of 16.5%, a range of 70.4%.
- ✓ Eight of Alberta's seventeen RHAs had a point estimate for this indicator that was less than the 12% primary cesarean section rate recommended by the US Department of Health and Human Services.
- ✓ No consistent urban/regional/rural pattern of difference was found for this indicator.
- ✓ Both urban RHAs: 4 (Calgary) and 10 (Capital), one regional RHA: 16 (Northern Lights) and three rural RHAs: 3 (Headwaters, 7 (East Central) and 14 (Peace) were above or significantly above the provincial average.
- ✓ One regional and two rural RHAs were similar to the provincial average.
- ✓ Three regional and five rural RHAs were below or significantly below the provincial average.

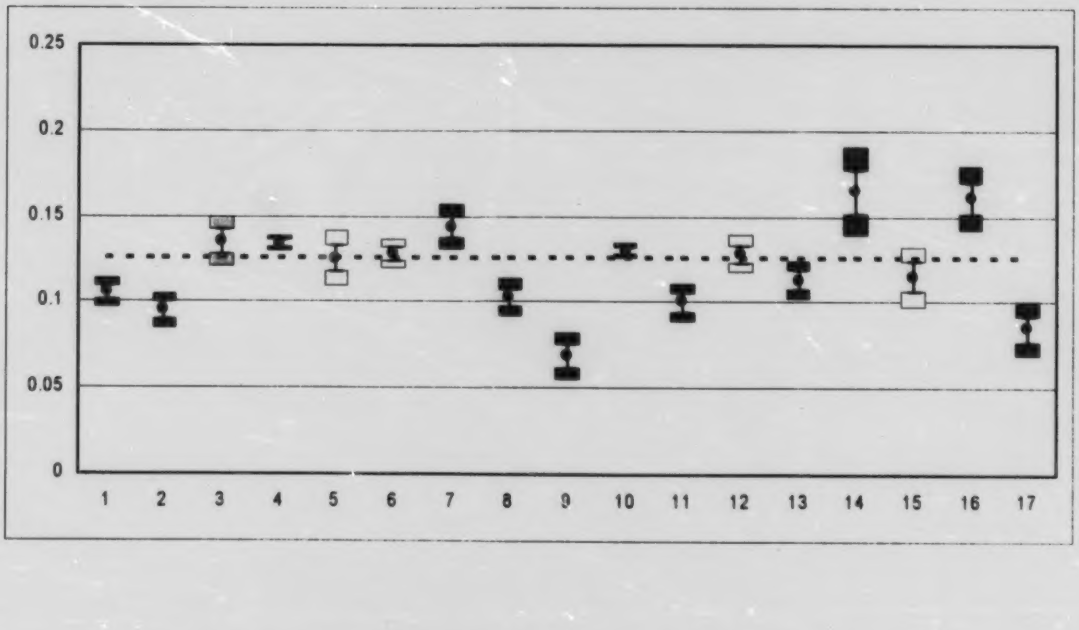
Are the service region indicators different?

Those RHAs that were significantly above the provincial average by residence were not necessarily significantly above the provincial average by service region. The performance of RHAs 3 (Headwaters) and 7 (East Central) for this indicator improved when it was calculated on a service basis. The performance of RHA 6 (David Thompson) worsened.

Number and Percent of Primary Cesarean Sections by RHA During 1997/98, 1998/99 and 1999/00


15
12
6
5
Significantly Lower
Lower
Average
Higher
Significantly Higher

RHA	Residence RHA		Service RHA	
1	10.6	■	10.9	■
2	9.5	■	8.5	■
3	13.5	▨	10.6	■
4	13.4	■	13.7	■
5	12.5	□	10.4	■
6	12.8	□	13.6	■
7	14.4	■	12.7	□
8	10.3	■	8.9	■
9	6.9	■	3.6	■
10	13.0	■	13.4	■
11	10.0	■	8.0	■
12	12.8	□	11.3	■
13	11.3	■	11.2	■
14	16.5	■	15.5	■
15	11.5	□	8.1	■
16	16.1	■	14.8	■
17	8.5	■	6.4	■
Province	12.6		12.6	



Indicator # 14 - General Anaesthetic Rate for Cesarean Section

Type of Indicator: Population – intrapartum - access

Why is this indicator important?

Cesarean section requires anaesthesia by one of three techniques, regional (epidural or spinal block), local anaesthetic infiltration or general anaesthesia. Regional anaesthesia allows the mother to remain awake, and permits early contact between mother and baby at birth. Although induction of general anaesthesia can be administered rapidly, it is associated with complications such as pulmonary aspiration, inadequate airway control and neonatal depression.

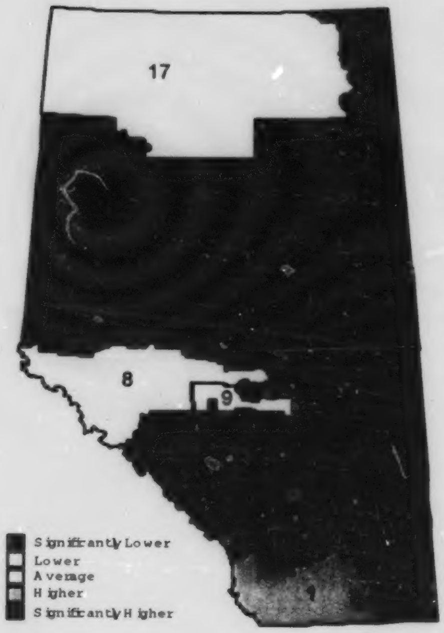
What does this indicator show?

- ✓ The point estimates for this indicator varied from a low of 4.3% to a high of 56.4%, a range of 52.1%.
- ✓ Overall, the indicator showed an urban/ (regional/rural) pattern of difference.
- ✓ The residents of both urban RHAs: 4 (Calgary) and 10 (Capital) were significantly below the provincial average.
- ✓ The residents of the five regional and eight out of ten rural RHAs tended to be similar to, above or significantly above the provincial average.
- ✓ The residents of RHAs: 3 (Headwaters) and 8 (Westview) were below or significantly below the provincial average.

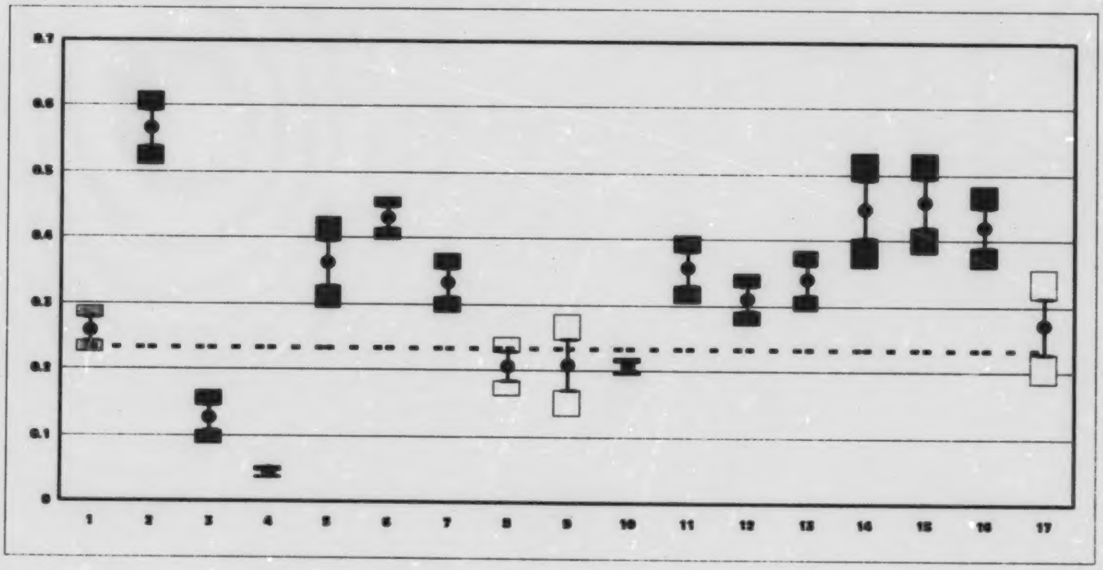
Are the service region indicators different?

Those RHAs that were significantly above the provincial average by residence region also tended to be significantly above the provincial average by service region.

Number and Percent of Cesarean Sections in Which General Anesthesia Was Used by RHA During 1997/98, 1998/99 and 1999/00


17
8
9
Significantly Lower
Lower
Average
Higher
Significantly Higher

RHA	Residence RHA		Service RHA	
1	25.9	▨	25.7	▨
2	56.4	■	61.6	■
3	12.8	■	13.7	■
4	4.3	■	4.5	■
5	36.2	■	50.8	■
6	43.0	■	44.5	■
7	33.3	■	32.3	■
8	20.6		16.3	
9	20.9		24.4	
10	20.7	■	21.7	■
11	35.6	■	52.9	■
12	31.0	■	37.3	■
13	33.9	■	34.1	■
14	44.7	■	50.3	■
15	45.7	■	55.6	■
16	42.0	■	39.3	■
17	27.1		10.0	■
Province	23.4		23.4	



Indicator # 15 - Percent of Cesarean Sections Performed by General Surgeons or General Practitioners

Type of Indicator: Population based – intrapartum - capability

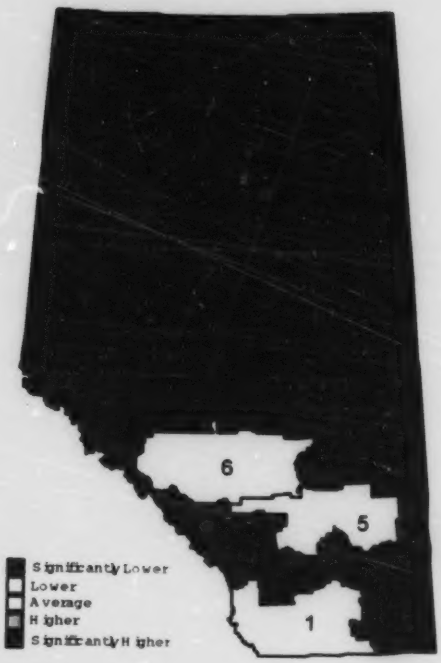
Why is this indicator important?

Many rural facilities provide obstetrical services without immediate access to obstetricians. In these RHAs, general practitioners or surgeons perform needed cesarean section services.[23] [24] Research has shown that general practitioners are less likely than obstetricians to perform cesarean sections.[25]

What does this indicator show?

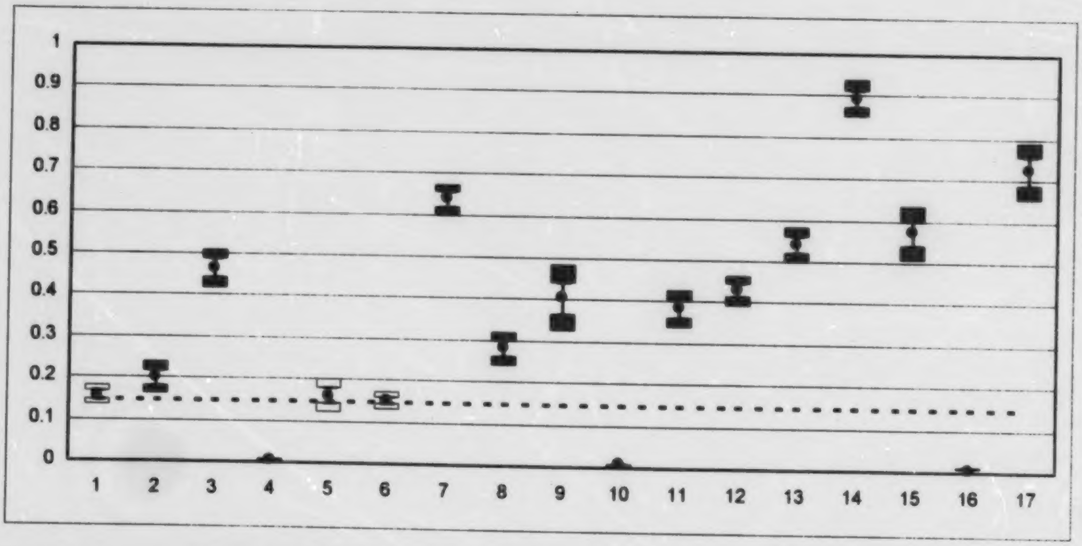
- ✓ The point estimates for this indicator varied from a low of 0.5% to a high of 89.4%, a range of 88.9%.
- ✓ Overall, the indicator showed a urban/ (regional/rural) pattern of difference.
- ✓ The residents of both the urban RHAs were significantly below the provincial average.
- ✓ The residents of four out of five regional and all ten rural RHAs were similar to or significantly above the provincial average.
- ✓ The residents of 16 (Northern Lights) were significantly below the provincial average.

Number and Percent of Cesarean Sections Performed by General Surgeons or General Practitioners During 1997/98, 1998/99 and 1999/00*


6
5
1
Significantly Lower
Lower
Average
Higher
Significantly Higher

Residence RHA	
1	15.7
2	20.0
3	46.4
4	0.5
5	16.1
6	15.1
7	63.7
8	28.2
9	40.5
10	0.8
11	38.4
12	43.0
13	54.1
14	89.4
15	57.2
16	0.5
17	72.4
Province	14.6

* Excludes missing provider types or provider types other than 01(Family Practitioner), 07(General Practitioner), 30(General Surgeon) or 50(Obstetrician & Gynecologist)



Indicator # 16 - Unattempted Vaginal Birth After Cesarean Section (VBAC) Rate

Type of Indicator: Population based – intrapartum - access

Why is this indicator important?

Successful vaginal birth after cesarean section typically carries lower health risks for mothers and requires shorter hospital stays than for those having a repeat cesarean section.[26] The Society of Obstetricians and Gynecologists of Canada recommends that a trial of labour be offered to all women with a history of a previous cesarean section with a lower uterine scar who are considered to be at low risk. The success rate for VBAC when offered to all women considered to be at low risk has been shown to vary from 50 to 80%.[27] The US Department of Health and Human Services established the Healthy People 2000 Objective to increase the VBAC rate to 35 or more per 100 births. [22]

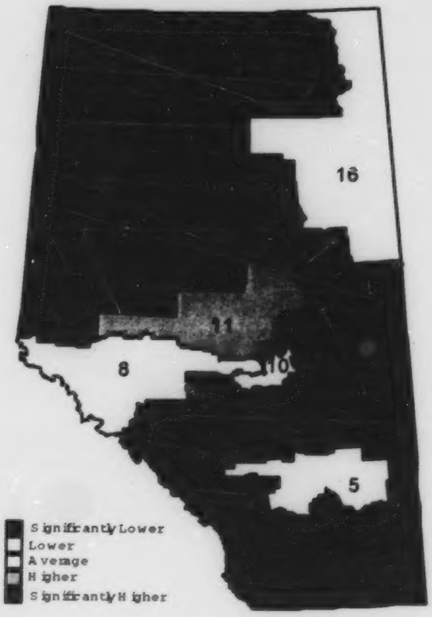
What does this indicator show?

- ✔ The point estimates for this indicator varied from a low of 73.7% to a high of 98.7%, a range of 25.0%.
- ✔ An overall urban /(regional/rural) pattern of difference was found for this indicator.
- ✔ Urban residents tended to be below or significantly below the provincial average,
- ✔ Regional and rural residents tended to be above or significantly above the provincial average.
- ✔ None of the seventeen RHAs in Alberta met the recommended the US Department of Health and Human services rate of 65% for unattempted VBAC. [22]

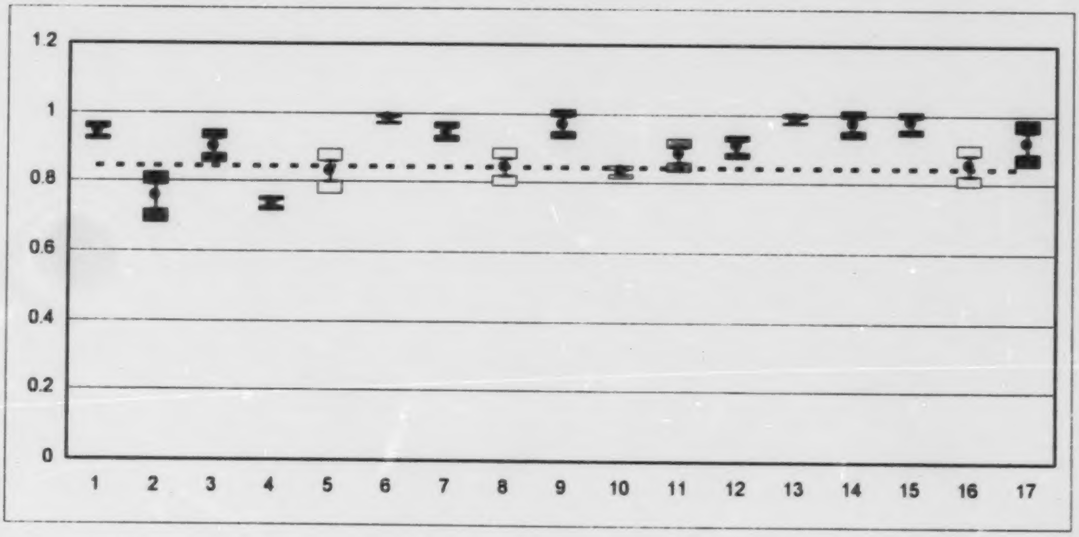
Are the service region indicators different?

Those RHAs that were significantly above the provincial average by residence region also tended to be significantly above the provincial average by service region.

Number and Percent of Unattempted VBACs by RHA During 1997/98, 1998/99 and 1999/00


16
11
8
10
5
Significantly Lower
Lower
Average
Higher
Significantly Higher

RHA	Residence RHA		Service RHA	
1	94.4	■	94.8	■
2	75.5	■	69.7	■
3	90.2	■	98.8	■
4	73.7	■	74.2	■
5	83.1		85.2	
6	98.2	■	99.4	■
7	94.7	■	94.5	■
8	84.6		70.5	■
9	97.1	■	98.4	■
10	83.4		84.7	
11	88.3	▨	97.0	■
12	90.8	■	91.4	■
13	98.7	■	98.8	■
14	97.2	■	98.8	■
15	97.7	■	100.0	■
16	85.7		85.5	
17	92.2	■	86.7	
Province	84.5		84.4	



Indicator # 17 - Maternal Post Vaginal Delivery Length of Stay Exceeding 48 Hours

Type of Indicator: Population based - postpartum - efficiency

Why is this indicator important?

There has been much debate regarding the required postpartum time in hospital for medical management of maternal and newborn patients after normal vaginal delivery or cesarean section. The controversy stems from the recommendations to target lengths of stays of 24 hours or less for vaginal delivery and 72 hours or less for cesarean section. Review of the literature suggests that early discharge is safe but should be individualized and the decision to discharge based upon the medical, social and economic considerations of each case.[28] The availability of community-based care is important factor in the success of early discharge programs.

What does this indicator show?

✔ The point estimates for this indicator varied from a low of 11.8% to a high of 60.1%, a range of 48.3%.

✔ No overall urban/regional/rural pattern of difference was found for this indicator.

✔ The residents of RHA 4 (Calgary) were above the provincial average. whereas the residents of RHA 10 (Capital) were significantly below.

✔ All five of the regional RHAs: 1 (Chinook), 2 (Palliser), 6 David Thompson), 13 (Mistahia) and 16 (Northern Lights), were significantly above the provincial average.

✔ Four out of the five rural RHAs that surround RHA 10 (Capital) were significantly below the provincial average. The other six rural RHAs were above or significantly above the provincial average.

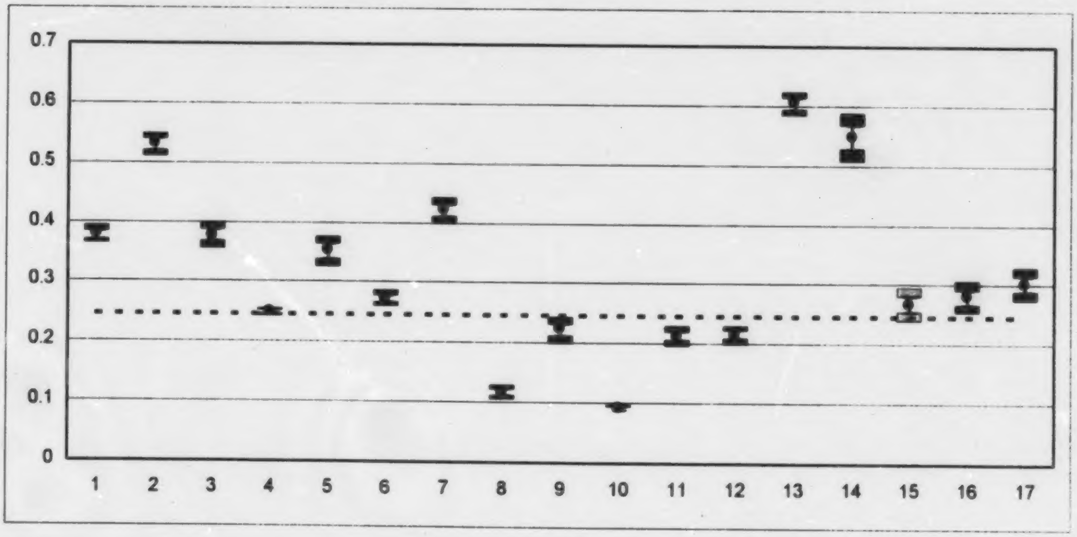
Are the service region indicators different?

Those RHAs that were significantly below the provincial average by residence were not necessarily significantly below by service region. Three of RHAs that were significantly below the provincial average by residence: 9 (Crossroads), 11 (Aspen) and 12(Lakeland) were above or significantly above the provincial average by service region.

Number and Percent of Maternal Separations in Which the Post-Delivery Length of Stay Exceeded 48 Hours by RHA During 1997/98, 1998/99 and 1999/00

Significantly Lower
Lower
Average
Higher
Significantly Higher

RHA	Residence RHA		Service RHA	
1	37.7	■	37.4	■
2	52.9	■	54.0	■
3	37.7	■	44.1	■
4	24.9	▨	24.9	▨
5	35.2	■	41.0	■
6	27.4	■	27.1	■
7	42.0	■	46.6	■
8	11.8	■	11.1	■
9	22.3	■	30.0	■
10	9.2	■	9.1	■
11	21.4	■	36.6	■
12	21.6	■	25.9	▨
13	60.4	■	63.5	■
14	54.8	■	55.4	■
15	26.8	▨	25.0	☐
16	28.0	■	28.3	■
17	30.2	■	28.5	■
Province	24.6		24.6	



Indicator # 18 - Percent of Newborns with a One-Minute Apgar Score <7

Type of indicator*:* Population based - new born - effectiveness

Why is this indicator important?

The ten-point Apgar score has been used to assess the condition and prognosis of newborns for almost 50 years.[29] The score is measured at one, five and ten minutes after birth and is the sum of five components (activity, pulse, grimace, appearance and respiration). An Apgar score of seven or higher indicates that the baby's condition is good to excellent. One minute Apgar scores may be a better marker for process of care rather than newborn outcomes. General anesthesia is associated with lower one minute Apgar scores.[30]

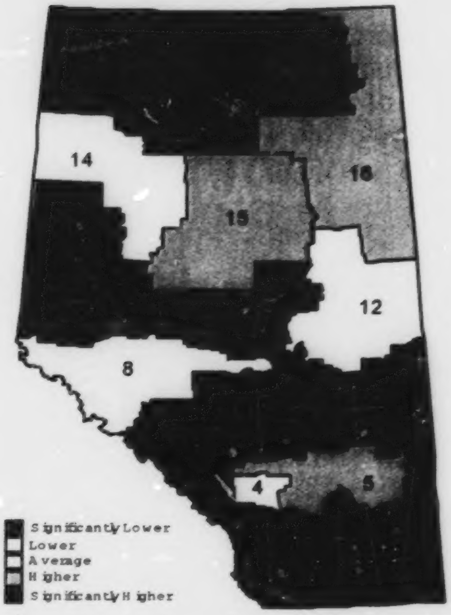
What does this indicator show?

- ✔ The point estimates for this indicator varied from a low of 10.2% to a high of 32.1%, a range of 21.9%.
- ✔ No consistent urban/regional/rural pattern of difference was found for this indicator.
- ✔ The residents of RHAs: 1 (Chinook), 2 (Palliser), 6 (David Thompson), 7 (East Central), and 17 (Northwestern) were significantly above the provincial average.
- ✔ The residents of RHAs: 3 (Headwaters), 9 (Crossroads), 10 (Capital), 11 (Aspen) and 14 (Peace) were significantly below the provincial average.

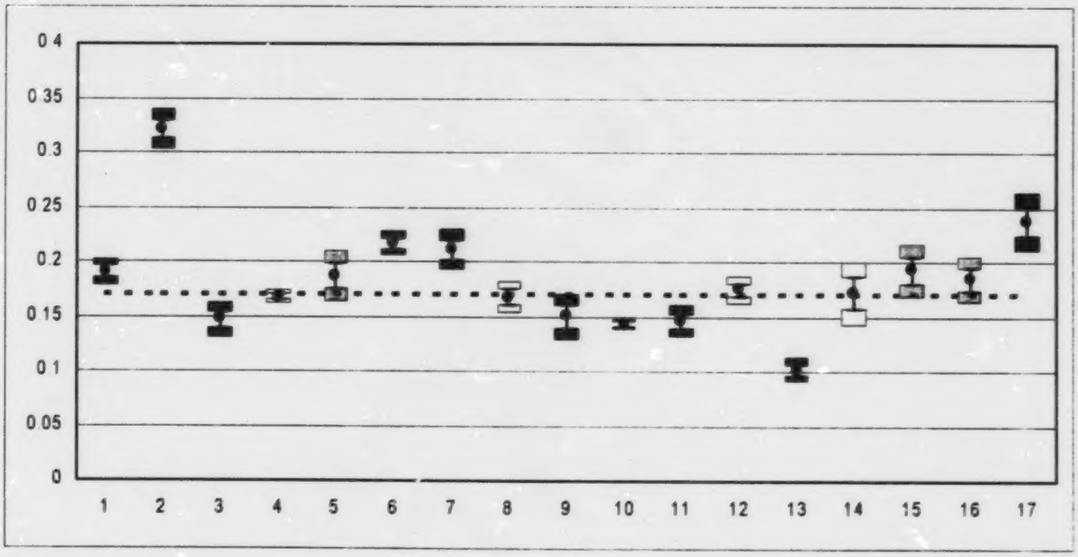
Are the service region indicators different?

Those RHAs that were significantly above the provincial average by residence region also tended to be significantly above the provincial average by service region.

Number and Percent of Births in Which the One Minute Apgar Scores <7 During 1997/98, 1998/99 and the First Three Quarters of 1999/00


14
15
16
12
8
4
5
Significantly Lower
Lower
Average
Higher
Significantly Higher

RHA	Residence RHA		Service RHA	
1	19.0	■	19.1	■
2	32.1	■	32.9	■
3	14.7	■	12.2	■
4	16.8	□	16.9	□
5	18.7	▨	17.0	□
6	21.7	■	22.1	■
7	21.1	■	22.1	■
8	16.8	□	14.7	■
9	15.0	■	16.1	□
10	14.3	■	14.9	■
11	14.6	■	14.2	■
12	17.5	□	17.8	□
13	10.2	■	9.3	■
14	17.2	□	17.1	□
15	19.3	▨	20.0	■
16	18.5	▨	17.9	□
17	23.7	■	24.5	■
Province	17.0		17.0	



Indicator # 19 - Potentially Preventable Newborn Readmission Rate

Type of Indicator: Population based – newborn - efficiency

Why is this indicator important?

The majority of potentially preventable newborn rehospitalizations are for infections or possible infections, [31] hyperbilirubinemia, and feeding or gastrointestinal problems.[32] In Alberta 75% of all potential preventable newborn readmissions within the first 28 days of life were due to hyperbilirubinemia.[33] Newborn readmission rates can be impacted by the availability community care.

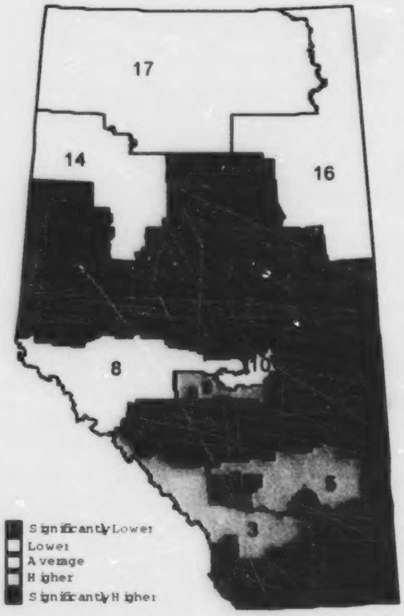
What does this indicator show?

- ✔ The point estimates for this indicator varied from a low of 2.7% to a high of 5.7%, a range of 3.0%.
- ✔ No consistent overall urban/regional/rural pattern of difference was found for this indicator.
- ✔ The residents of RHAs: 6 (David Thompson), 7 (East Central), 11 (Aspen), 12 (Lakeland), 13 (Mistahia) and 15 (Keeweetinok Lakes) were significantly above the provincial average.
- ✔ The residents of RHAs: 1 (Chinook), 2 (Palliser) and 4 (Calgary) were significantly below the provincial average.

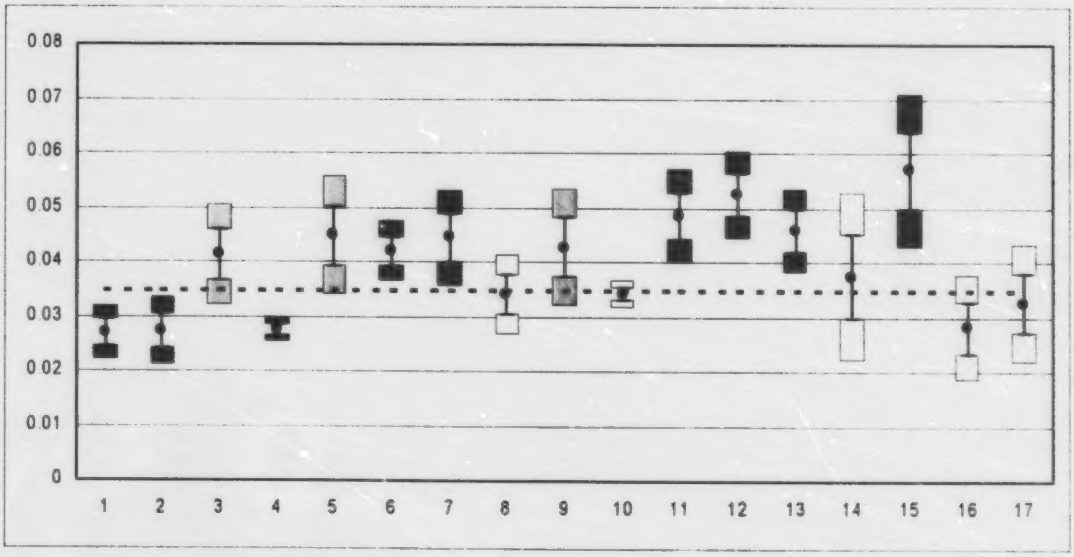
Are the service region indicators different?

Those RHAs that were significantly above the provincial average by residence were not necessarily significantly below by service region. RHAs: 6 (David Thompson) and 7 (East Central) which were significantly above the provincial average by region of residence were similar to the provincial average by region of service.

Number and Percent of Potentially Preventable Newborn Readmissions by Residence RHA During 1997/98 1998/99 and 1999/00


17
14
16
8
10
5
3
Significantly Lower
Lower
Average
Higher
Significantly Higher

RHA	Residence RHA		Service RHA	
1	2.7	■	2.8	■
2	2.7	■	2.7	■
3	4.1	▨	3.1	
4	2.8	■	2.9	■
5	4.5	▨	4.8	▨
6	4.2	■	3.3	
7	4.4	■	3.9	
8	3.4		4.4	▨
9	4.3	▨	7.4	■
10	3.4		3.7	▨
11	4.9	■	4.9	■
12	5.3	■	4.8	■
13	4.6	■	4.3	■
14	3.8		4.0	
15	5.7	■	5.3	■
16	2.8		2.7	
17	3.3		3.0	
Province	3.5		3.5	



STEP 7 IDENTIFYING MEANINGFUL PATTERNS

Although it is difficult to pull information produced from numerous indicators for several RHA populations into some sort of coherent whole, the result can provide valuable information about differences in utilization patterns by RHA grouping across quality of care dimensions.

We developed five comparative figures to help accomplish this task (Figures 10 through 14). The first figure presents information for the five access indicators, the second for the four appropriateness indicators, the third for the five efficiency indicators, the fourth for the four capability indicators, and the fifth for the single effectiveness indicator. All five figures present residence-based indicator information.

The same colour scheme as was used in the graphs and maps is used in each of the five figures. As in previous discussions, **indicators that are "Red" are always potential utilization improvement priorities**. For example:

- ✔ in Figure 10, red means that access to these services for regional residents when compared to the provincial average is poor;
- ✔ in Figure 11, red means that the rate of intrapartum intervention for the residents of these regions compared to the provincial average is high;
- ✔ in Figure 12, red means that these services are not being provided to the residents of these regions as efficiently as they are elsewhere;
- ✔ in Figure 13, red means that there may be a problem in maintaining the capability/skill of the providers/facilities providing these services; and
- ✔ in Figure 14, red means that the expected treatment outcome for the residents of this region when compared to the provincial average has not been achieved.

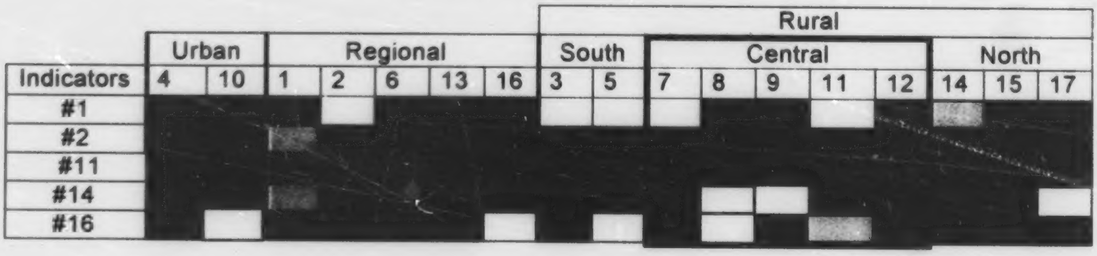
■ significantly higher than the provincial average
▨ higher than the provincial average
□ average
░ lower than the provincial average
■ significantly lower than the provincial average

Figure 9: Map and Graph Colour Scheme

Access Indicators

Access focuses on the ability of people to obtain health services at the right place and time irrespective of income, RHA of residence or cultural background.

#1 Percent of first time mothers not attending antenatal education,
#2 Percent of mothers receiving no antenatal physician visits,
#11 Rate of Non-use of spinal/epidural analgesia for vaginal delivery,
#14 General anesthetic rate for cesarean section,
#16 Unattempted vaginal birth after cesarean section (VBAC) rate.



								Rural									
	Urban		Regional					South		Central					North		
Indicators	4	10	1	2	6	13	16	3	5	7	8	9	11	12	14	15	17
#1	■	■	■	□	■	■	■	□	□	□	■	■	□	■	▨	■	■
#2	■	■	▨	■	■	■	■	■	■	■	■	■	■	■	■	■	■
#11	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
#14	■	■	▨	■	■	■	■	■	■	■	□	□	■	■	■	■	□
#16	■	□	■	■	■	■	□	■	□	■	□	■	▨	■	■	■	■

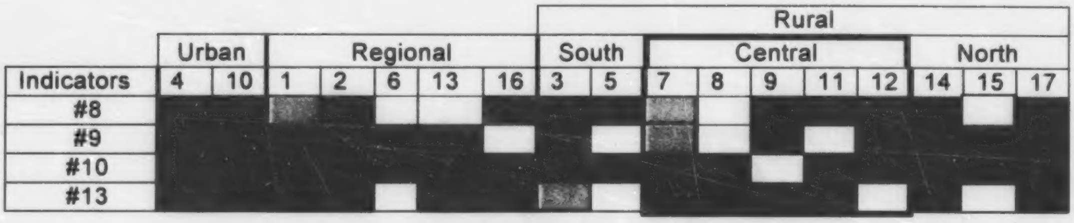
Figure 10 Access Indicators

- Remember that in Figure 10, red means that access to these services for regional residents when compared to the provincial average is poor.
  - ✔ There is an urban/ (regional/rural) difference by RHA of residence for access indicators.
  - ✔ In general, the residents of RHAs 4 (Calgary) and 10 (Capital) tended to have better access to these services than the residents of regional or rural regions.
  - ✔ Among regional RHAs, access was highest in RHA 16 (Northern Lights) and lowest in RHAs 6 (David Thompson) and 13 (Mistahia).
  - ✔ Among rural RHAs, access was highest in RHA 8 (Westview) and lowest in RHA 12 (Lakeland) and 15 (Keeweetinok Lakes).

Appropriateness Indicators

Appropriateness focuses on care/intervention/action provided that is relevant to the resident's needs and based on established standards.

#8 Medical induction rate,
#9 Instrumental birth rate,
#10 Episiotomy rate, and
#13 Primary cesarean section rate



								Rural									
	Urban		Regional					South		Central					North		
Indicators	4	10	1	2	6	13	16	3	5	7	8	9	11	12	14	15	17
#8	■	■	▨	■	□	□	■	■	■	▨	□	■	■	■	■	□	■
#9	■	■	■	■	■	■	□	■	□	▨	□	■	□	■	■	■	■
#10	■	■	■	■	■	■	■	■	■	■	■	□	■	■	■	■	■
#13	■	■	■	■	□	■	■	▨	□	■	■	■	■	□	■	□	■

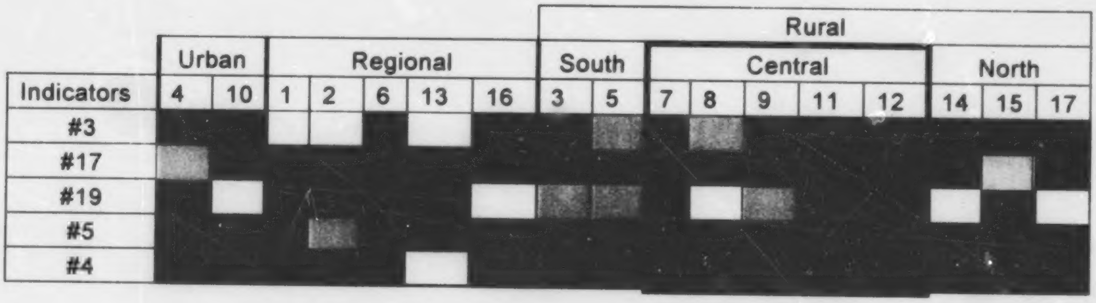
Figure 11 Appropriateness Indicators

- Remember that in Figure 11, red means that the rate of intrapartum intervention for the residents of these regions compared to the provincial average is high.
  - ✔ Appropriateness indicators show the opposite urban/(regional/rural) pattern to that seen for access indicators.
  - ✔ The rate of these four intrapartum interventions is highest for the residents of the two urban RHAs: 4 (Calgary) and 10 (Capital).
  - ✔ RHA16 (Northern Lights) stands out when compared to the other four regional RHAs. The intrapartum intervention pattern for RHA 16(Northern Lights) is similar to that found for the residents of RHAs 4(Calgary) and 10(Capital).
  - ✔ Among the rural RHAs the residents of 7 (East Central) have the greatest chance of intrapartum intervention and the residents of 8 (Westview), 15 (Keeweetinok Lakes) and 17 (Northwestern) the lowest.

Efficiency Indicators

Efficiency refers to achieving desired results with the most cost-effective use of resources.

#3 Rate of admission for false labour,
#17 Maternal LOS exceeding 48 hours,
#19 Potentially preventable newborn readmission rate,
#5 Percent of residents who did not deliver at their nearest facility, and
#4 Percent of low obstetrical antenatal risk mothers who deliver outside their home RHA.



								Rural									
	Urban		Regional					South		Central					North		
Indicators	4	10	1	2	6	13	16	3	5	7	8	9	11	12	14	15	17
#3	■	■	□	□	■	□	■	■	▨	■	▨	■	■	■	■	■	■
#17	▨	■	■	■	■	■	■	■	■	■	■	■	■	■	■	▨	■
#19	■	□	■	■	■	■	□	▨	▨	■	□	▨	■	■	□	■	□
#5	■	■	■	▨	■	■	■	■	■	■	■	■	■	■	■	■	■
#4	■	■	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■

Figure 12 Efficiency Indicators

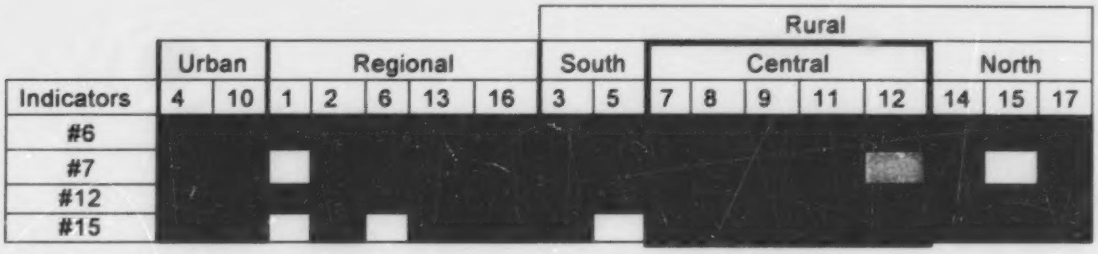
- Remember that in Figure 12, red means that these services are not being provided to the residents of these regions as efficiently as they are elsewhere.

  - ✔ Efficiency indicators show an urban/ (regional/rural) pattern of difference that is similar to the pattern found for access indicators.
  - ✔ The two urban RHAs: 4 (Calgary) and 10 (Capital) tend to be more efficient than the regional or rural regions.
  - ✔ Among the five regional regions, RHA 6 (David Thompson) seems to be the least efficient.
  - ✔ Among the rural regions, RHA 7(East Central) seems to be the least efficient.

Capability Indicators

Capability refers to an individual's or facility's capacity to provide a health service based on the assumption of increased skills or knowledge will increase health service volume or speciality accreditation.

#6 Percent of deliveries in Type I (low volume) facilities,
#7 Percent of deliveries by low volume providers,
#12 Percent of singleton infants >=2,500 grams delivered vaginally by obstetricians, and
#15 Percent of caesarean sections performed by general surgeons or general practitioners.



								Rural									
	Urban		Regional					South		Central					North		
Indicators	4	10	1	2	6	13	16	3	5	7	8	9	11	12	14	15	17
#6	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
#7	■	■	□	■	■	■	■	■	■	■	■	■	■	▨	■	□	■
#12	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
#15	■	■	□	■	□	■	■	■	□	■	■	■	■	■	■	■	■

Figure 13 – Capability Indicators

❖ Remember that in Figure 13, red means that there may be a problem in maintaining the capability/skill of the providers/facilities providing these services.

✔ Two different service patterns can be seen in Figure 13.

✔ As was the pattern for access and efficiency indicators, the two urban regions, RHAs 4 (Calgary) and 10 (Capital) seem to perform differently than do regional or rural regions. Capability is less of an issue for the urban regions.

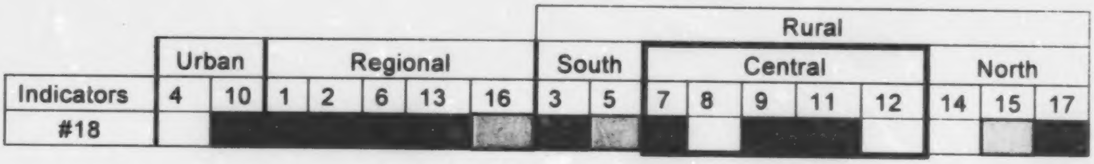
✔ Among the rural regions, a north/ (south/central) difference seems to exist for this group of indicators.

✔ Capability is less of an issue for RHAs 12 (Lakeland), 15 (Keeweetinok Lakes) and 17 (Northwestern) than it is for the other seven rural regions.

Effectiveness Indicators

Effectiveness refers to whether or not a service achieves the desired outcome.

#18 Percent of newborns with a one-minute Apgar score <7



								Rural									
	Urban		Regional					South		Central					North		
Indicators	4	10	1	2	6	13	16	3	5	7	8	9	11	12	14	15	17
#18	□	■	■	■	■	■	▨	■	▨	■	□	■	■	□	□	▨	■

Figure 14 Effectiveness Indicators

- Remember that in Figure 14, red means that the expected treatment outcome for the residents of this region when compared to the provincial average has not been achieved.
  - ✔ This single indicator seems to shows an urban/ regional pattern of difference.
  - ✔ RHAs: 4(Calgary) and 10(Capital) were similar to or lower than the provincial average for effectiveness.
  - ✔ The regional regions with the exception of RHA 16 (Northern Lights) tended to be above the provincial average.
  - ✔ No consistent pattern was found across the ten rural regions.

Potential Utilization Improvement Priorities for the Provision of Maternal & Newborn Care by Residence RHA

Potential utilization improvement priorities for health regions are shown in Figure 15.

In this report, a potential utilization improvement priority was defined as any indicator in which the point estimate (rate) for the indicator by region of residence or region of service was significantly above the provincial average. In other words, the indicator was shown in red. The letter "R" or "S" has been added to each of the identified utilization priorities to help regions identify the appropriate target population for improvement. If the red box in the figure contains an "R", the target population would be all regional residents regardless of where they receive services. If the red box contains an "S", the target population would be regional residents who receive services in their home region.

Dimension	Indicator	RHA																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Access	1. No Antenatal Education						■			■	■		■	■		■	■	■
	2. No Antenatal Physician Visits		■	■		■	■	■	■	■		■	■	■	■	■		■
	11. No epidural/spinal for vag. delivery	■	■	■		■	■	■		■		■	■	■	■	■		■
	14. General for CS		■			■	■	■				■	■	■	■	■	■	
	16. Unattempted VBAC	■		■			■	■		■		■	■	■	■	■		■
Appropriateness	8. Medical Induction	■								■	■	■	■				■	
	9. Instrumental Birth				■			■			■		■					
	10. Episiotomy				■	■		■			■						■	
	13. Primary CS				■		■	■			■				■		■	
Efficiency	3. Admission for False Labour					■	■	■		■		■	■		■	■	■	■
	17. Post-Vaginal Delivery LOS	■	■	■		■	■	■		■		■		■	■		■	■
	19. Preventable NB Readmission						■	■		■		■	■	■		■		
	5. Not at Nearest Facility	■		■		■	■	■	■	■		■	■	■	■	■		■
	4. Low Risk Outflow			■		■	■	■	■	■		■	■		■	■		■
Capability	6. Births at Type 1 Facilities	■	■	■		■	■	■	■			■		■	■			
	7. Low volume GP/FP Deliveries			■		■	■	■	■	■		■			■		■	
	12. Singleton infants				■	■											■	
	15. CS by GS or GP		■	■				■	■	■		■	■	■	■	■		■
Effectiveness	19. One-Minute Apgar <7		■	■			■	■								■		■

Figure 15: Potential Utilization Improvement Priorities for the Delivery of Maternal and Newborn Care by Region of Residence

STEP 8 – COMMUNICATING RESULTS

The final step in the eight-step utilization analysis process is communicating results. A range of different strategies have been proposed for this utilization analysis, the first of which is the production and circulation of this report to all 17 RHAs. In addition, interactive presentations are also being planned with each of the five participating RHAs.

APPENDICES

APPENDIX A – THE UTILIZATION IMPROVEMENT CYCLE

The utilization improvement cycle is a continuous four-part process that can be used to improve health system performance.

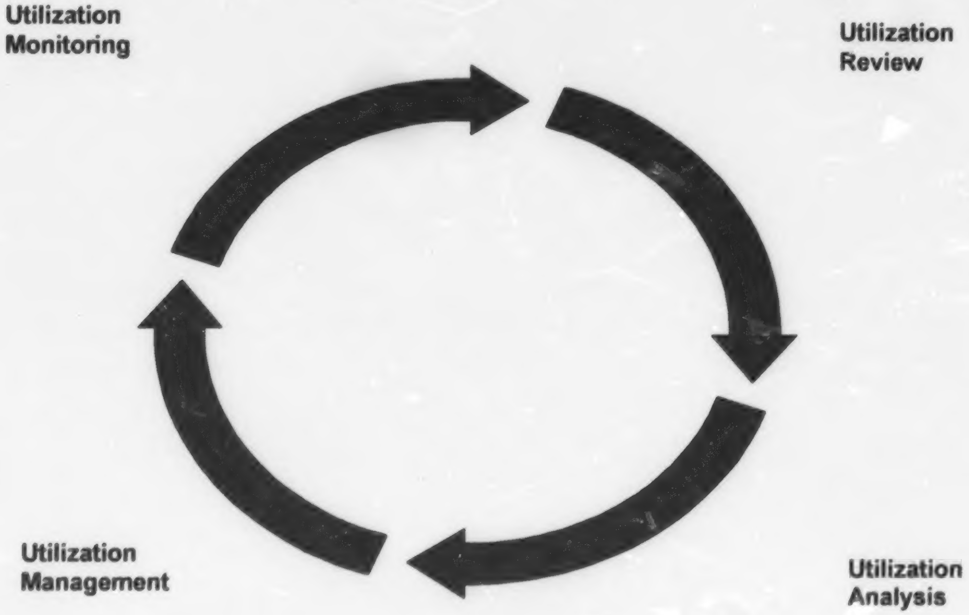


Figure 16 The Utilization Improvement Cycle

Utilization Review

The first step in the utilization improvement cycle, **utilization review**, is undertaken to provide a descriptive overview of health service use. This overview can be broad in scope or limited to a narrow range of health services (e.g., cardiac surgery); specific service providers (e.g., a specific hospital), or an identifiable group of service recipients (e.g., those over 64 years of age). Utilization review accomplishes two important things: (1) it provides a common starting place for service providers by creating a shared information-based picture of regional service delivery, and (2) it helps to identify priority areas for utilization analysis.

Utilization Analysis

The second step in the cycle, **utilization analysis**, introduces the element of comparison. It involves the identification and development of a set of indicators that can be used to identify potential areas for utilization improvement. Utilization analysis is completed using an eight-step process:

- **Step 1** defining the utilization analysis question,
- **Step 2** developing the analytic framework,
- **Step 3** identifying and developing indicators
- **Step 4** identifying relevant comparison groups,
- **Step 5** gaining access to databases and building the dataset(s),
- **Step 6** identifying statistically significant differences,
- **Step 7** identifying meaningful patterns, and
- **Step 8** communicating results.

Utilization Management

The third step in the process, **utilization management** translates utilization analysis findings into action and involves completion of four sequential tasks:

1. Interpreting utilization analysis findings in terms of the regional service context. This may involve collecting additional information, e.g., about a region's population, its facilities, programs, or physicians. It may also involve meeting with front-line service providers to ensure that utilization analysis results "make sense" to them.

2. Identifying action priorities. It is not uncommon for utilization review/utilization analysis activities to identify several service provision issues. Deciding which one to address requires careful examination of the options for change. Completion of this task may involve a comprehensive review of current best practice "evidence" or appropriate literature, consultation with regional health service providers and recipients, and/or the completion of cost-benefit studies.

3. Implementing the utilization management initiative(s).

4. Developing a strategy to evaluate the expected change.

Utilization Monitoring

The final step in the utilization improvement cycle, **utilization monitoring**, focuses on the identification, standardization and continued collection of information to monitor regional health service delivery on an ongoing basis. This may or may not be limited to routinely collected administrative information.

APPENDIX B – EXPLANATION OF TERMS

Antepartum (AP) – before the onset of labour.

Low Birth Weight (LBW) – birth weight less than 2,500 grams.

Intrapartum – during labour.

Multipara – a woman who has born more than one child.

Nulliparous – a woman who has not given birth to a viable child.

Postpartum – after childbirth or after delivery.

Primipara – a woman bearing a first offspring, or woman that has borne only one offspring.

APPENDIX C – ADDITIONAL TABULAR INFORMATION

Table C1 Number of Deliveries (MPS=51) by Type and Number of Newborns (MPS=54) by Residence RHA During 1997/98, 1998/99 and 1999/00

	Deliveries		
	Using CIHI DAD Procedure Codes		
Residence RHA*	Total Deliveries	Cesarean Sections	Vaginal Deliveries
1	6,056	972	5,084
2	3,589	474	3,115
3	2,575	490	2,085
4	33,773	6,176	27,597
5	1,981	378	1,603
6	7,501	1,393	6,108
7	3,360	740	2,620
8	3,383	516	2,867
9	1,452	163	1,289
10	28,880	5,263	23,617
11	3,212	483	2,729
12	4,374	837	3,537
13	3,923	655	3,268
14	902	208	694
15	1,425	242	1,183
16	1,721	394	1,327
17	1,447	181	1,266
Province	109,554	19,565	89,989
Missing/Invalid Postal Codes*	2,218	414	1,804
Total Cases	111,772	19,979	91,793

* Includes only those separations with a valid Alberta postal code

Table C2 Number of Deliveries (MPS=51) by Age Group and Residence RHA at Time of Delivery During 1997/98, 1998/99 and 1999/00

	Age Group in Years at Delivery						
Residence RHA	<20	20-24	25-29	30-34	35-39	40-44	45+
	%	%	%	%	%	%	%
1	9.0	26.9	32.1	21.8	8.8	1.3	0.1
2	8.4	26.2	33.7	23.4	7.0	1.2	0.1
3	6.4	18.2	31.1	29.0	13.3	2.0	0.0
4	4.5	15.4	29.9	32.2	15.4	2.4	1.2
5	7.2	23.5	36.2	23.6	8.1	1.4	0.0
6	9.6	25.7	32.1	23.1	8.5	1.0	0.1
7	6.4	22.7	34.6	26.5	8.5	1.3	0.2
8	8.5	21.5	32.7	25.9	10.1	1.2	0.1
9	8.1	27.7	33.5	21.5	7.9	1.2	0.0
10	6.4	19.1	31.0	28.7	12.7	2.0	0.6
11	8.7	24.0	34.0	24.1	7.8	1.4	0.0
12	10.2	24.3	32.9	23.5	8.1	0.8	0.0
13	9.4	28.0	33.0	20.8	7.4	1.4	0.4
14	12.7	27.8	31.6	19.0	7.4	1.3	0.1
15	14.6	30.9	29.3	19.4	4.8	1.0	0.1
16	10.6	26.7	30.8	23.4	7.6	0.9	0.0
17	14.3	33.2	29.2	16.0	6.3	0.9	0.0
Province	7.0	20.6	31.4	27.4	11.7	1.8	0.6

NOTE: Maternal ages are not available for all deliveries

Table C3 Number and Percent of Deliveries (MPS=51) by Parity* by Residence RHA During 1997/98, 1998/99 and 1999/00

	Primipara		Multipara	
Residence RHA	#	%	#	%
1	1,812	35.3	3,322	64.7
2	1,176	40.4	1,735	59.6
3	814	40.1	1,214	59.9
4	9,155	46.5	10,535	53.5
5	410	34.8	767	65.2
6	2,319	37.5	3,866	62.5
7	774	35.6	1,400	64.4
8	1,039	37.7	1,718	62.3
9	447	32.7	922	67.3
10	10,287	42.9	13,705	57.1
11	991	36.1	1,757	63.9
12	1,228	34.2	2,364	65.8
13	1,288	39.8	1,945	60.2
14	264	37.6	438	62.4
15	365	33.0	740	67.0
16	617	43.5	803	56.5
17	293	25.9	837	74.1
Province	33,279	40.9	48,068	59.1

* Based on data set #5 - Linked Vital Statistics Birth Registry Information & Delivery Information

Table C4 Number and Percent of Multiple Births by Residence RHA During 1997/98, 1998/99 and 1999/00*

	Singleton Births		Multiple Births	
Residence RHA	#	%	#	%
1	5,979	98.7	77	1.3
2	3,544	98.7	45	1.3
3	2,545	98.8	30	1.2
4	33,259	98.5	514	1.5
5	1,955	98.7	26	1.3
6	7,407	98.7	94	1.3
7	3,329	99.1	31	0.9
8	3,330	98.4	53	1.6
9	1,438	99.0	14	1.0
10	28,558	98.9	322	1.1
11	3,184	99.1	28	0.9
12	4,338	99.2	36	0.8
13	3,879	98.9	44	1.1
14	896	99.3	6	0.7
15	1,407	98.7	18	1.3
16	1,705	99.1	16	0.9
17	1,434	99.1	13	0.9
Province	108,187	98.8	1,367	1.2

Based on data set # 3 - Linked Newborn and Delivery Information

Table C5 Number and Percent of Deliveries in Which the Mother had Diabetes (Gestational or Pre-existing) or Hypertension by Residence RHA in 1997/98, 1998/99 and 1999/00

	Total Diabetes		Hypertension	
Residence RHA	#	%	#	%
1	211	3.5	326	5.4
2	207	5.8	192	5.3
3	91	3.5	189	7.3
4	2,176	6.4	2,216	6.6
5	86	4.3	91	4.6
6	202	2.7	387	5.2
7	72	2.1	191	5.7
8	82	2.4	170	5.0
9	46	3.2	84	5.8
10	1,109	3.8	1,517	5.3
11	92	2.9	199	6.2
12	126	2.9	223	5.1
13	82	2.1	177	4.5
14	11	1.2	30	3.3
15	42	2.9	94	6.6
16	27	1.6	77	4.5
17	24	1.7	66	4.6
Province	4,686	4.3	6,229	5.7

Based on data set # 1 - Deliveries

Table C6 Number and Percent of Low Birth Weight (LBW) Newborns (<2,500 Grams) by Residence RHA During 1997/98, 1998/99 and 1999/00

	LBW Newborns	
Residence RHA	#	%
1	339	5.5
2	202	5.6
3	168	6.5
4	2,244	6.6
5	100	5.0
6	442	5.8
7	169	5.0
8	210	6.1
9	90	6.2
10	1,807	6.2
11	159	4.9
12	226	5.1
13	209	5.3
14	54	6.0
15	83	5.7
16	89	5.1
17	84	5.8
Province	6,675	6.0

Based on data set # 2 - Newborns

Table C7 Number and Percent of Mothers Who Delivered by Aboriginal Treaty Status and Low Socioeconomic Status by Residence RHA During 1997/98, 1998/99 and 1999/00*

	Aboriginal Treaty Status*		Low Socioeconomic Status*	
Residence RHA	#	%	#	%
1	942	15	1,411	23
2	241	7	650	18
3	385	15	381	15
4	1,847	5	5,102	15
5	288	14	341	17
6	1,267	17	1,249	17
7	426	12	653	19
8	399	12	451	13
9	232	13	328	18
10	2,169	8	5,868	20
11	405	13	508	16
12	967	21	633	14
13	425	11	606	15
14	169	19	133	15
15	665	46	187	13
16	281	16	257	15
17	589	40	230	16
Province	11,697	11	18,988	17

Based on data set # 3 - Linked Newborn and Delivery Information

*Aboriginal treaty status was defined as aboriginal treaty registration with the Federal Department of Indian Affairs and Northern Development. Low socioeconomic status was defined as either receiving subsidization for the Alberta Health Care Insurance Premium or receiving welfare. Those with aboriginal treaty registration are not included in the low socioeconomic status group

Table C8 Number and Percent of Mothers Who Delivered by Marital Status at the Time of Birth by Residence RHA During 1997/98, 1998/99 and 1999/00*

	Not Married*		Married*	
Residence RHA	#	%	#	%
1	1,260	25	3,874	75
2	765	26	2,146	74
3	533	26	1,495	74
4	3,521	18	16,169	82
5	251	21	926	79
6	2,056	33	4,128	67
7	441	20	1,732	80
8	799	29	1,958	71
9	525	38	842	62
10	6,316	26	17,673	74
11	829	30	1,917	70
12	1,243	35	2,349	65
13	1,032	32	2,201	68
14	240	34	462	66
15	686	62	419	38
16	585	41	835	59
17	407	36	723	64
Province	21,082	26	59,126	73

Based on data set # 5 - Linked Vital Statistics Birth Registry Information and Delivery Information

* Never Married includes never married, widowed and divorce. Married includes married only.

APPENDIX D - METHODOLOGY COMPENDIUM

Indicator #1-Percent of First-time Mothers Not Receiving Antenatal Education

Data Source:

- Alberta Vital Statistics Birth Registry 1997, 1998 and 1999.

Numerator:

- Start with Dataset #5-Linked Vital Statistics Birth Registry Information and delivery information.
- Select all first time mothers (number of live births =1).
- Select those who attended antenatal education classes during their pregnancy (2=yes).

Denominator:

- All first time mothers who did or did not attend antenatal education classes (1=no, 2=yes).

Indicator # 2-Percent of Mothers Receiving No Antenatal Physician Visits

Data Source:

- Alberta Claims Assessment Database 1997/98, 1998/99, 1999/00.
- Alberta Vital Statistics Birth Registry 1997, 1998 and 1999.

Numerator:

- Start with Dataset #5-Linked Vital Statistics Birth Registry Information and delivery information.
- Identify all matched birth records in which the number of times the expectant mother visited a physician prior to delivery was 0 or not recorded (blank).

- Create an ASN match file for all those mothers in which this field was 0 or blank.

- Now use Dataset #4-Linked Physician Claim and delivery Information. Use the ASN match file to select all CLASS prenatal physician visits (03.03B-Prenatal visit) for these mothers.

- If no prenatal physician visits were found in CLASS give this mother a 0. If one or more prenatal physician visits were found in CLASS remove this mother from the no prenatal physician visit group.

Denominator:

- All cases in Dataset #5-Linked Vital Statistics Birth Registry Information and delivery information.

Indicator # 3-Rate of Admission for False Labour

Data source:

- CIHI DAD 1996/97, 1997/98, 1998/99 and 1999/00

Numerator:

- Start with Dataset#1- Deliveries.

- Create a match file of ASNs for these mothers.

- Identify any separation for these individuals with an ICD-9-CM code of 644.13 (false labour NOS after 37 weeks of gestation) in the most responsible diagnosis field. Note: you will need to look in the 1996/97 CIHI DAD data file for the last quarter to be sure that all separations related to deliveries that take place in the first quarter of 1997/98 are identified).

- Link each of these false labour separations to the appropriate MPS=51 separation. Note: if the mother delivered more than once in the study period you will need to be sure you have attributed the false labour separations to the appropriate delivery record.

- Calculate the difference between the admission date for the false labour separation and the admission date for the delivery separation.

- Exclude any false labour separation which occurred more than 3 weeks (21 days) before the delivery admission date. (This exclusion criteria was required due to coding inconsistencies, 644.13 was used before 37 weeks of gestation).

Denominator:

- All separations in Dataset#1-Deliveries.

Indicator # 4- Percent of Low Obstetrical Antenatal Risk Mothers Who Deliver Outside Their Home RHA

Data source:

- CIHI DAD 1997/98, 1998/99 and 1999/00.

Numerator:

- Start with Dataset #1-Deliveries.
- Identify all low obstetrical antenatal risk mothers - include any separations in which any of the following ICD-9=CM codes are **NOT** found in any of the sixteen diagnostic fields:

651.01	Twin pregnancy
651.11	Triplet pregnancy
651.21	Quadruplet pregnancy
651.31	Twin pregnancy with fetal loss and retention of one fetus
651.41	Triplet pregnancy with fetal loss and retention of one or more fetus(es)
651.51	Quadruplet pregnancy with fetal loss and retention of one or more fetus(es)
651.61	Other multiple pregnancy with fetal loss and retention of one or more fetus(es)
651.81	Other specific multiple gestation
651.91	Unspecified multiple gestation
652.01	Unstable lie
652.11	Breech or other malpresentation successfully converted to cephalic presentation
652.21	Breech presentation without mention of version
652.31	Transverse or oblique presentation
652.41	Face or brow presentation

652.51	High head at term
652.61	Multiple gestation with malpresentation of one fetus or more
652.71	Prolapsed arm
652.81	Other specified malposition or malpresentation
652.91	Unspecified malposition or malpresentation
653.11	Generally contracted pelvis
653.21	Inlet contraction of pelvis
653.21	Inlet contraction of pelvis
653.31	Outlet contraction of pelvis
653.41	Fetopelvic disproportion
653.51	Unusually large fetus causing disproportion
653.61	Hydrocephalic fetus causing disproportion
653.71	Other fetal abnormality causing disproportion
653.81	Disproportion of other origin
653.91	Unspecified disproportion
654.01	Congenital abnormalities of uterus
654.11	Tumors of body of uterus
654.21	Previous cesarean section
654.31	Retroverted and incarcerated gravid uterus
654.41	Other abnormalities in shape or position of gravid uterus and neighbouring structures
654.51	Cervical incompetence
654.61	Other congenital or acquired abnormality of the cervix
654.71	Congenital or acquired abnormality of vagina
654.81	Congenital or acquired abnormality of the vulva
654.91	Other and unspecified

- Exclude separations in which the mother delivered in her home RHA

Denominator:

- All low obstetrical antenatal risk mothers.

Indicator # 5-Percent of Residents Who Do Not Deliver at Their Nearest Facility

Data source:

- CIHI DAD 1997/98, 1998/99 and 1999/00.
- Alberta Treasury 1999/00 Postal Code Cross Reference File

Numerator:

- Start with the geocoded Postal Code Cross Reference File prepared by Alberta Treasury for Alberta Health and Wellness. This file groups the over 75,000 current Alberta postal codes into 594 provincial municipal names.
- Identify all MPS-51 delivery facilities on the geocoded file by creating a new field to identify the appropriate municipal name on the geocoded file.
- Calculate the distance between the identified RHA residence and the municipality name for each acute care facility.
- Now use Dataset #1 and create a link between the postal code at service date and the municipality name using the geocoded Postal Code Cross Reference.
- Identify all RHA residents who did **not** deliver at their nearest facility.

Denominator:

- All deliveries by residence RHA regardless of where they took place.

Indicator # 6-Percent of Deliveries in Type 1 (Low Volume) Facilities

Data source:

- CIHI DAD 1997/98, 1998/99 and 1999/00.

Numerator:

- Start with Dataset #1-Deliveries.
- Identify all deliveries that occurred in a type one facility (a facility in which there was **not**, on average, at least 50 deliveries/year during 1997/98, 1998/99 and 1999/00).
- Exclude any deliveries which took place in University Hospital, Edmonton.

Denominator:

- All deliveries by residence RHA regardless of the facility in which they took place.

Indicator # 7-Percent of Deliveries by Low Volume Providers (General Practitioners or Family Practitioners)

Data source:

- CLASS 1997/98, 1998/99 and 1999/00.

Numerator:

- Start with Dataset#4-Linked Physician Claim and Delivery Information.
- Identify all procedure delivery codes in CLASS (CCP-CM codes: 87.98A-vaginal delivery; 87.98C-vaginal delivery following previous cesarean section; 86.0-classical cesarean section; 86.1-cervical cesarean section, 86.9A-B, cesarean section of unspecified type).
- Select those delivery codes billed by provider specialty GP = general practice.
- Identify the first and last billing record submitted by general practitioners and family practitioners during 1997/98, 1998/99 and 1999/00. Exclude physicians who only claimed for one delivery during the identified time period.
- Calculate the number of deliveries (total number of deliveries minus 1 during the time period divided by days difference between first and last billing).
- Select those who did not average at least 25 births per year or 72 for the three years of the study.

Denominator:

- All deliveries billed by general practitioners and family practitioners (provider specialty = GP = general practitioner) during the study period.

Indicator # 8-Medical Induction Rate

Data Source:

- CIHI DAD 1997/98, 1998/99 and 1999/00

Numerator:

- Start with Dataset #1-Deliveries.
- Identify all separations in which any of five ICD-9-CM cesarean section codes are **NOT** found in any one of ten procedure code fields.

74.0	Classical cesarean section
74.1	Low cervical cesarean section
74.2	Extraperitoneal cesarean section
74.4	Cesarean section of other specified type
74.99	Other cesarean section of unspecified type

- For these vaginal births, select all separations in which an ICD-9-CM code of 73.4 (medical induction of labour) is found in any one of ten procedure fields.

Denominator:

- All vaginal deliveries.

Indicator # 9-Instrumental Birth Rate

Data source:

- CIHI DAD 1997/98, 1998/99 and 1999/00

Numerator:

- Start with Dataset #1-Deliveries.
- Identify all separations in which any of five ICD-9-CM cesarean section codes are **NOT** found in any one of ten procedure code fields.

74.0	Classical cesarean section
74.1	Low cervical cesarean section
74.2	Extraperitoneal cesarean section
74.4	Cesarean section of other specified type
74.99	Other cesarean section of unspecified type

- For these vaginal births, select all separations in which any of the following ICD-9-CM codes are found in any of the ten procedure fields.

72.0	Low forceps operation
72.1	Low forceps operation with episiotomy
72.2	Mid forceps operation
72.21	Mid forceps operation with episiotomy
72.29	Other mid forceps operation
72.3	High forceps operation
72.31	High forceps with episiotomy
72.39	Other high forceps operation
72.4	Forceps rotation of fetal head
72.51	Partial breech extraction with forceps to aftercoming head
72.53	Total breech extraction with forceps to aftercoming head
72.6	Forceps application to aftercoming head
72.71	Vacuum extraction
72.79	Other vacuum extraction
72.8	Other instrumental delivery
72.9	Unspecified instrumental delivery
73.3	Failed forceps

Denominator:

- All vaginal deliveries.

Indicator # 10-Episiotomy Rate

Data source:

- CIHI DAD 1997/98, 1998/99 and 1999/00.
- Alberta Vital Statistics Birth Registry 1997, 1998, 1999.

Numerator (All Vaginal Births):

- Start with Dataset #1-Deliveries.
- Identify all separations in which any of five ICD-9-CM cesarean section codes are **NOT** found in any one of ten procedure code fields.

74.0	Classical cesarean section
74.1	Low cervical cesarean section
74.2	Extraperitoneal cesarean section
74.4	Cesarean section of other specified type
74.99	Other cesarean section of unspecified type

- For these vaginal births, select all separations in which any of the following ICD-9-CM codes are found in any one of ten procedure fields.

72.1	Low forceps operation with episiotomy
72.21	Mid forceps operation with episiotomy
72.31	High forceps operation with episiotomy
72.71	Vacuum extraction with episiotomy
73.6	Episiotomy

Denominator (All Vaginal Births):

- All vaginal deliveries.

Indicator # 11-Rate of No Epidural/Spinal Analgesia During Labour for Vaginal Deliveries

Data source:

- CLASS 1997/98, 1998/99 and 1999/00.

Numerator:

- Start with Dataset #4-Linked Physician Claim and Delivery Information.
- Select all billing records for vaginal deliveries (CCP-CM codes: 87.98A-vaginal delivery; 87.98C-vaginal delivery following previous cesarean section). Create a match file of ASNs for these mothers.
- Use this match file to select all billing records with a CCP-CM procedure code of 16.91C (epidural analgesia for labour and delivery, initial set-up, including up to 45 minutes of continuous attendance per patient).

Denominator:

- All CLASS delivery billing records (CCP-CM codes: 87.98A-vaginal delivery or 87.98C-vaginal delivery following previous cesarean section).

Indicator # 12-Percent of Singleton Infants > 2,500 Grams Delivered Vaginally by Obstetricians

Data sources:

- CIHI DAD 1997/98, 1998/99 and 1999/00.
- CLASS 1997/98, 1998/99 and 1999/00 (Note: this indicator could not be created solely using CIHI DAD records for 1997/98, 1998/99 and 1999/00 because 2/3 of the non-cesarean section deliveries during this time period did not have any procedural coding included).

Numerator:

- Start with Dataset #3 – Linked Newborn and Delivery Information.
- Identify all separations in which any of five ICD-9-CM cesarean section codes are **NOT** found in any one of ten procedure code fields.

74.0	Classical cesarean section
74.1	Low cervical cesarean section
74.2	Extraperitoneal cesarean section
74.4	Cesarean section of other specified type
74.99	Other cesarean section of unspecified type

- For these vaginal deliveries identify singleton infants – any separation in which the following ICD-9-CM codes are **not** found in any of 16 diagnostic codes.

651.01	Twin pregnancy
651.11	Triplet pregnancy
651.21	Quadruplet pregnancy
651.31	Twin pregnancy with fetal loss and retention of one fetus
651.41	Triplet pregnancy with fetal loss and retention of one or more fetus(es)
651.51	Quadruplet pregnancy with fetal loss and retention of one or more fetus(es)
651.61	Other multiple pregnancy with fetal loss and retention of one or more fetus(es)
651.81	Other specific multiple gestation
651.91	Unspecified multiple gestation

- Exclude any cases in which the newborn weight is less than 2,500 grams.
- Create a match file of the ASNs for these mothers.
- Use this match file to identify unique deliveries in (CCP-CM codes: 87.98A-vaginal delivery; 87.98C-vaginal delivery following previous cesarean section).
- Use the CLASS provider speciality variable to identify delivery billings submitted by obstetricians, OB/GYN-obstetrics and gynaecology.

Denominator:

- All matched delivery billings identified in CLASS regardless of provider specialty.

Indicator # 13-Primary Cesarean Section Rate

Data Source:

- CIHI DAD 1997/98, 1998/99 and 1999/00.

Numerator (Primary Cesarean Section):

- Start with Dataset #1-Deliveries.
- Exclude all separations in which the ICD-9-CM code 654.21(previous cesarean delivery) is found in any of 16 diagnostic fields.
- Select all separations in which any of the following ICD-9-CM codes are found in any one of ten procedure code fields:

74.0	Classical cesarean section
74.1	Low cervical cesarean section
74.2	Extraperitoneal cesarean section
74.4	Cesarean section of other specified type
74.99	Other cesarean section of unspecified type

Denominator:

- Start with all MPS=51 separations.
- Exclude all separations in which the ICD-9-CM code 654.21(previous cesarean delivery) is found in any of 16 diagnostic fields.

Indicator # 14-General Anesthesia Rate for Cesarean Section

Data source:

- CIHI DAD 1997/98, 1998/99 and 1999/00 (RHA#4-Calgary provided this information to the Information Analysis Branch of Alberta Health and Wellness directly).

Numerator:

- Start with all Dataset #1-Deliveries.
- Identify all separations in which any of five ICD-9-CM cesarean section codes is found in any one of ten procedure code fields.

74.0	Classical cesarean section
74.1	Low cervical cesarean section
74.2	Extraperitoneal cesarean section
74.4	Cesarean section of other specified type
74.99	Other cesarean section of unspecified type

- Identify the corresponding anesthetic technique field for the cesarean section procedure codes (1-1, 2-2, 3-3, etc.) and select any cesarean section in which the anesthetic technique field contains 4=general anesthetic.

	1	2	3	4	5	6	7	8	9	10
Procedure code field		74.1								
Anesthetic technique		4								

Denominator:

- All cesarean sections

Indicator # 15-Percent of Cesarean Sections Performed by General Surgeons or General Practitioners

Data source:

- CIHI DAD 1997/98, 1998/99 and 1999/00

Numerator:

- Start with Dataset #1-Deliveries.
- Identify all separations in which any of five ICD-9-CM cesarean section codes is found in any one of ten procedure code fields.

74.0	Classical cesarean section
74.1	Low cervical cesarean section
74.2	Extraperitoneal cesarean section
74.4	Cesarean section of other specified type
74.99	Other cesarean section of unspecified type

- For each cesarean section procedure code (74.0, 74.1, 74.2, 74.4 or 74.99) identify the corresponding provider type field and select those cesarean sections with a provider type of 01-family practitioner, 07-general practitioner, or 30-general surgeon.

	1	2	3	4	5	6	7	8	9	10
Procedure code field	74.1									
Provider Type field	07									

Denominator:

- All cesarean sections regardless of provider type.

Indicator # 16-Unattempted VBAC Rate

Data Source:

- CIHI DAD 1997/98, 1998/99 and 1999/00.

Numerator:

- Start with Dataset #1-Deliveries.
- Identify all **previous cesarean sections** – any separation in which the following ICD-9-CM code 654.21 (previous cesarean delivery) is found in any of 16 diagnostic fields.
- Include all separations in which an ICD-9-CM code failed trial of labour 660.6 is **NOT** found in any of 16 diagnostic fields.

- Identify **current cesarean sections** - all separations in which any of five ICD-9-CM cesarean section codes **is** found in any one of ten procedure code fields.

74.0	Classical cesarean section
74.1	Low cervical cesarean section
74.2	Extraperitoneal cesarean section
74.4	Cesarean section of other specified type
74.99	Other cesarean section of unspecified type

Denominator:

- All **previous cesarean sections** – any separation in which the following ICD-9-CM code 654.21 (previous cesarean delivery) is found in any of 16 diagnostic fields.

Indicator # 17-Percent of Vaginal Deliveries of Singletons (>=2,500 Grams) in Which the Mother's Length of Stay Post-Delivery Exceeded 48 Hours

Data source:

- CIHI DAD 1997/98, 1998/99 and 1999/00
- AHCIP (Alberta Health Care Insurance Plan).

Numerator:

- Start with Dataset #3-Linked Newborn and Delivery Information to calculate the maternal length of stay after delivery in hours (maternal discharge date and time – newborn admission date and time) for all deliveries.
- Exclude all linked cases in which the newborn was not a vaginally delivered singleton newborns >= 2,500 grams.
- Identify all vaginally born infants. Identify all separations in which any of five ICD-9-CM cesarean section codes is **not** found in any one of ten procedure code fields.

74.0	Classical cesarean section
74.1	Low cervical cesarean section
74.2	Extraperitoneal cesarean section
74.4	Cesarean section of other specified type
74.99	Other cesarean section of unspecified type

- Identify singleton births – any separation in which the following ICD-9-CM codes are **not** found in any of 16 diagnostic codes.

651.01	Twin pregnancy
651.11	Triplet pregnancy
651.21	Quadruplet pregnancy
651.31	Twin pregnancy with fetal loss and retention of one fetus
651.41	Triplet pregnancy with fetal loss and retention of one or more fetus(es)
651.51	Quadruplet pregnancy with fetal loss and retention of one or more fetus(es)
651.61	Other multiple pregnancy with fetal loss and retention of one or more fetus(es)
651.81	Other specific multiple gestation
651.91	Unspecified multiple gestation

- Select only those newborns with a birthweight of >=2,500 grams.
- Include those linked cases in which the maternal post-delivery length of stay exceeded 48 hours

Denominator:

- Number vaginally delivered singleton newborns >= 2,500 grams.

Indicator #18 - Percent of Newborns with a One-Minute Apgar Score < 7

Data Source:

- Alberta Vital Statistics Birth Registry 1997, 1998 and 1999.

Numerator:

- Start with Dataset #5-Linked Vital Statistics Birth Registry Information and Delivery Information.
- Select all births with a one minute Apgar score < 7.

Denominator:

- All five minute Apgar scores for all live births (exclude missing).

Indicator # 19-Potentially Preventable Newborn Readmission Rate

Data Source:

- CIHI DAD 1997/98, 1998/99 and 1999/00.

Numerator:

- Start with Dataset #3-Linked delivery and newborn information.
- Identify all vaginally born infants. Identify all separations in which any of five ICD-9-CM cesarean section codes is **not** found in any one of ten procedure code fields.

74.0	Classical cesarean section
74.1	Low cervical cesarean section
74.2	Extraperitoneal cesarean section
74.4	Cesarean section of other specified type
74.99	Other cesarean section of unspecified type

- Identify singleton births – any separation in which the following ICD-9-CM codes are **not** found in any of 16 diagnostic codes.

651.01	Twin pregnancy
651.11	Triplet pregnancy
651.21	Quadruplet pregnancy
651.31	Twin pregnancy with fetal loss and retention of one fetus
651.41	Triplet pregnancy with fetal loss and retention of one or more fetus(es)
651.51	Quadruplet pregnancy with fetal loss and retention of one or more fetus(es)
651.61	Other multiple pregnancy with fetal loss and retention of one or more fetus(es)
651.81	Other specific multiple gestation
651.91	Unspecified multiple gestation

- Select only those newborns with a birthweight of >=2,500 grams.
- Create an ASN match file for these newborns.

- Identify any separation for these newborns within 28 days period after the MPS=54 discharge date (separations for those born in March of one fiscal year will need to identified in April of the next).

- Select those separations in which the following ICD-9-CM codes are found in the most responsible diagnosis field:

783.2	Abnormal loss of weight
783.4	Lack of expected normal physiological development
773.1	Hemolytic disease due to ABO isoimmunization
774.2	Neonatal jaundice associated with preterm delivery
774.30	Neonatal jaundice due to delayed conjugation, cause unspecified
774.31	Neonatal jaundice due to delayed conjugation in disease classified elsewhere
774.39	Other jaundice due to delayed conjugation
774.6	Unspecified fetal and neonatal jaundice
774.7	Kernicterus not due to isoimmunization
276.0	Hyperosmolality and/or hypernatremia
276.5	Volume depletion
775.5	Other transitory neonatal electrolyte disturbances
778.4	Other disturbances of temperature regulation of newborn
779.3	Feeding problems in newborn
783.3	Feeding difficulties and mismanagement
V20.1	Other health infant or child receiving care
V65.0	Healthy person accompanying sick person, border

Denominator:

- Number of vaginally delivered singleton newborns >=2,500 grams

APPENDIX E - FACILITY LISTING BY TYPE

Hospitals providing maternal delivery services were categorized into six groups on the basis of the average number of deliveries per year over the three year period, metropolitan location, and level of newborn facilities: Group 1 (1 to 49 deliveries/year - 29 hospitals); Group 2 (50 to 99 deliveries/year - 13 hospitals); Group 3 (100 to 405 deliveries/year - 32 hospitals); Group 4 (631 to 1,691 deliveries/year - 5 hospitals located in one of the five non-metropolitan regional health care cities); Group 5 (5 hospitals located in the metropolitan RHAs, Calgary and Capital hospitals); Group 6 (2 hospitals containing a Level 3 neonatal intensive care - one hospital in each of two metropolitan centres.

RHA	Facility Name	Facility Type
04	Calgary, Foothills Medical Centre	6
10	Edmonton, Royal Alexandra Hospital	6
04	Calgary, Rockyview General Hospital	5
04	Edmonton, Misericordia Community Hospital	5
10	Edmonton, Grey Nuns Community Hospital	5
10	Edmonton, University Hospital, WCM Centre	5
10	Leduc Community Hospital	5
10	St. Albert, Sturgeon Community Hospital	5
04	Calgary, Peter Lougheed Centre	5
13	Grande Prairie, Queen Elizabeth II	4
01	Lethbridge, Lethbridge Regional Hospital	4
02	Medicine Hat Regional Hospital	4
06	Red Deer Regional Hospital	4
16	Fort McMurray, Northern Lights Regional	4
03	Banff, Mineral Springs Hospital	3
11	Barrhead Healthcare Centre/Keir Centre	3
02	Brooks Health Centre	3
07	Camrose, St. Mary's Hospital	3
03	Canmore General Hospital	3
01	Cardston Health Centre	3
12	Cold Lake Health Centre	3
09	Drayton Valley Health Centre	3
05	Drumheller District Health Services	3
08	Edson Health Centre	3
12	Fort Saskatchewan Health Centre	3

17	Fort Vermilion, St. Therese General Hospital	3
15	High Prairie Health Centre	3
03	High River Hospital & Nursing Home	3
08	Hinton Health Centre	3
12	Lac La Biche, WJ Cadzow Health Centre	3
06	Lacombe Community Health Centre	3
06	Olds Health Centre	3
14	Peace River, Peace River General Hospital	3
06	Ponoka General Hospital	3
07	Provost Health Centre	3
06	Rocky Mountain House General Hospital	3
07	Stettler Health Centre	3
12	St. Paul, St, Therese Health Centre	3
01	Taber Health Centre	3
11	Westlock Healthcare Centre	3
09	Wetaskiwin Health Centre	3
11	Whitecourt Healthcare Centre	3
15	Slave Lake Health Centre	3
17	High Level Community Health Centre	3
12	Bonnyville Health Centre	3
07	Daysland Health Centre	2
01	Fort Macleod Health Care Centre	2
06	Innisfail Health Centre	2
14	McLennan, Sacred Heart Health Centre	2
01	Pincher Creek Health Centre	2
05	Three Hills District Health Services	2
13	Valleyview Health Complex	2
12	Vegreville, St. Joseph's General Hospital	2
07	Vermilion Health Care Complex	2
07	Viking Health Centre	2
07	Wainwright Community Health Centre	2
13	Grimshaw-Berwyn & District Hospital	2
05	Strathmore District Health Services	2
11	Athabasca Healthcare Centre	1
13	Beaverlodge Municipal Hospital	1
01	Blairmore, Crowsnest Pass Health Centre	1
02	Bow Island Health Centre	1
11	Boyle Healthcare Centre	1
07	Castor, Our Lady Health Centre	1
03	Claresholm General Hospital	1
07	Consort Health Centre	1

07	Coronation Health Centre	1
05	Didsbury Health Centre	1
13	Fairview Health Complex	1
05	Hanna District Health Services	1
08	Jasper, Seton General Hospital	1
14	Manning Health Centre	1
11	Mayerthorpe Healthcare Centre	1
01	Milk River, Border Counties General Hospital	1
02	Oyen, Big Country Health Centre	1
01	Raymond Health Centre	1
06	Rimbey Community Health Centre	1
13	Spirit River, Central Peace General Hospital	1
08	Stony Plain Health Centre	1
07	Tofield Health Centre	1
12	Two Hills Health Centre	1
03	Vulcan Community Health Centre	1
06	Sundre Hospital and Care Centre	1
13	Grande Cache General Hospital	1
11	Fox Creek Healthcare Centre	1
11	Swan Hills Healthcare Centre	1
15	Wabasca-Desmarais Health Centre	1
12	Smoky Lake, George McDougall Memorial	*
03	Black Diamond, Oilfields General Hospital	*

* Fewer than 1 delivery per year and not listed by facility type.

APPENDIX F INDICATOR AND DENOMINATOR INFORMATION

Table F1 Percent of First-time Mothers Not Attending Antenatal Education

	Residence	
RHA	**Numerator**	**Denominator**
1	450	1,708
2	365	1,108
3	241	712
4	2,326	8,439
5	92	290
6	883	2,028
7	224	693
8	255	910
9	166	410
10	3,267	8,937
11	294	888
12	424	1,102
13	473	1,219
14	98	250
15	121	206
16	262	601
17	96	158
Province	10,037	29,659

Table F2 Percent of Mothers Receiving No Antenatal Physician Visits

	Residence	
RHA	Numerator	Denominator
1	184	5,267
2	137	2,989
3	106	2,093
4	277	20,375
5	65	1,341
6	316	6,364
7	133	2,257
8	126	2,847
9	102	1,583
10	523	24,426
11	120	2,753
12	155	3,815
13	132	3,288
14	46	726
15	143	1,153
16	34	1,460
17	99	1,197
Province	**2,698**	**83,934**

Table F3 Rate of Admission for False Labour

	Residence		Service	
RHA	Numerator	Denominator	Numerator	Denominator
1	94	6,056	91	6,283
2	66	3,589	71	3,681
3	17	2,575	8	1,603
4	230	33,773	243	36,345
5	45	1,981	31	1,093
6	174	7,501	174	6,904
7	99	3,360	97	2,958
8	67	3,383	14	1,299
9	56	1,452	61	1,768
10	334	28,880	431	35,914
11	82	3,212	74	1,596
12	184	4,374	171	3,246
13	62	3,923	63	3,884
14	42	902	58	998
15	87	1,425	64	1,069
16	57	1,721	68	1,893
17	86	1,447	83	1,238
Province	**1,782**	**109,554**	**1,802**	**111,772**

Table F4 Percent of Low Obstetrical Antenatal Risk Mothers Who Deliver Outside Their Home RHA

	Residence	
RHA	**Numerator**	**Denominator**
1	90	4,818
2	168	2,854
3	777	2,061
4	137	27,271
5	789	1,566
6	788	5,930
7	482	2,558
8	1,769	2,709
9	292	1,157
10	191	22,254
11	1,284	2,570
12	1,002	3,398
13	288	3,223
14	93	743
15	260	1,186
16	33	1,152
17	147	1,210
Province	**8,590**	**86,660**

Table F5 Percent of Residents Who Do Not Deliver at Their Nearest Facility

	Residence	
RHA	Numerator	Denominator
1	2,710	6,056
2	1,094	3,589
3	1,731	2,575
4	1,824	33,773
5	1,445	1,981
6	3,773	7,501
7	1,892	3,360
8	2,556	3,383
9	666	1,452
10	5,177	28,880
11	2,316	3,212
12	2,340	4,374
13	1,749	3,923
14	441	902
15	840	1,425
16	208	1,721
17	1,030	1,447
Province	**31,792**	**109,554**

Table F6 Percent of Deliveries in Type 1 (Low Volume) Facilities

	Residence	
RHA	**Numerator**	**Denominator**
1	305	6,283
2	155	3,681
3	199	1,603
4	0	36,345
5	129	1,093
6	229	6,904
7	105	2,433
8	185	1,299
9	0	1,768
10	0	35,914
11	175	1,596
12	6	3,246
13	332	3,884
14	87	998
15	7	1,069
16	0	1,893
17	0	1,238
Province	**1,914**	**111,247**

Table F7 Percent of Deliveries by Low Volume General Practitioners/ Family Practitioners

	Residence	
RHA	**Numerator**	**Denominator**
1	286	2,695
2	120	1,847
3	354	1,515
4	315	10,458
5	249	901
6	800	4,133
7	319	2,379
8	242	1,566
9	179	899
10	340	4,333
11	258	1,840
12	288	2,527
13	189	2,828
14	110	778
15	106	1,087
16	10	30
17	65	1,244
Province	**4,230**	**41,060**

Table F8 Medical Induction Rate

	Residence		Service	
RHA	Numerator	Denominator	Numerator	Denominator
1	1,263	5,084	1,315	5,242
2	322	3,115	311	3,249
3	377	2,085	152	1,361
4	5,945	27,597	6,525	29,553
5	320	1,603	94	907
6	1,464	6,108	1,336	547
7	656	2,620	509	2,376
8	683	2,867	96	1,143
9	394	1,289	405	1,643
10	6,429	23,617	8,409	29,082
11	708	2,729	265	1,407
12	922	3,537	527	2,714
13	785	3,268	769	3,226
14	128	694	137	776
15	263	1,183	185	946
16	407	1,327	463	1,490
17	202	1,266	155	1,131
Province	**21,268**	**89,989**	**21,653**	**91,793**

Table F9 Instrumental Birth Rate

	Residence		Service	
RHA	**Numerator**	**Denominator**	**Numerator**	**Denominator**
1	764	5,084	777	5,242
2	355	3,115	365	3,249
3	328	2,085	195	1,361
4	6,455	27,597	6,881	29,553
5	320	1,603	164	907
6	434	6,108	353	5,547
7	528	2,620	504	2,376
8	555	2,867	222	1,143
9	204	1,289	221	1,643
10	4,974	23,617	6,082	29,082
11	493	2,729	219	1,407
12	753	3,537	543	2,714
13	292	3,268	261	3,226
14	84	694	85	776
15	118	1,183	77	946
16	258	1,327	276	1,490
17	177	1,266	167	1,131
Province	**17,092**	**89,989**	**17,392**	**91,793**

Table F10 Episiotomy Rate

	Residence		Service	
RHA	**Numerator**	**Denominator**	**Numerator**	**Denominator**
1	677	6,056	693	6,283
2	371	3,589	391	3,681
3	348	2,575	227	1,603
4	6,556	33,773	6,940	36,345
5	405	1,981	265	1,093
6	1,218	7,501	1,183	6,904
7	737	3,360	669	2,958
8	441	3,383	89	1,299
9	267	1,452	304	1,768
10	5,946	28,880	7,029	35,914
11	503	3,212	283	1,596
12	650	4,374	492	3,246
13	556	3,923	555	3,884
14	115	902	129	998
15	193	1,425	175	1,069
16	865	1,721	853	1,893
17	132	1,447	122	1,238
Province	**19,980**	**109,554**	**20,399**	**111,772**

Table F11 Rate of No Epidural/Spinal Analgesia for Vaginal Delivery

	Residence		Service	
RHA	Numerator	Denominator	Numerator	Denominator
1	4,222	5,084	4,470	5,219
2	2,993	3,097	3,191	3,239
3	1,507	2,094	1,204	1,355
4	13,677	27,721	16,787	29,536
5	1,187	1,613	845	906
6	5,574	6,065	5,215	5,454
7	2,297	2,721	1,720	1,912
8	1,786	2,862	655	1,139
9	1,370	1,618	1,571	1,641
10	12,415	23,330	17,696	29,060
11	2,136	2,744	1,285	1,397
12	2,990	3,642	2,519	2,660
13	3,035	3,234	3,095	3,177
14	651	688	749	775
15	1,102	1,198	898	913
16	745	1,336	981	1,484
17	1,239	1,280	1,121	1,126
Province	**58,926**	**90,327**	**64,002**	**90,993**

Table F12 Percent of Singleton Infants >= 2,500 Grams Delivered Vaginally by Obstetricians

	Residence	
RHA	Numerator	Denominator
1	2,067	4,292
2	1,009	2,516
3	496	1,637
4	9,343	15,994
5	374	1,062
6	1,606	5,009
7	350	1,667
8	1,132	2,329
9	635	1,350
10	15,388	19,117
11	823	2,266
12	1,032	3,011
13	529	2,654
14	46	542
15	167	944
16	1,065	1,095
17	84	1,015
Province	**36,146**	**66,500**

Table F13 Primary Cesarean Section Rate

	Residence		Service	
RHA	**Numerator**	**Denominator**	**Numerator**	**Denominator**
1	600	5,684	639	5,881
2	327	3,442	300	3,549
3	326	2,411	161	1,522
4	4287	31,884	4,686	34,239
5	230	1,833	105	1,012
6	896	7,004	874	6,421
7	440	3,060	347	2,723
8	328	3,195	112	1,255
9	95	1,384	61	1,704
10	3536	27,153	4,519	33,601
11	303	3,032	123	1,530
12	521	4,058	346	3,060
13	417	3,685	405	3,631
14	137	831	142	918
15	154	1,337	83	1,029
16	254	1,581	258	1,748
17	117	1,383	77	1,208
Province	**12,968**	**102,957**	**13,238**	**105,031**

Table F14 General Anaesthetic Rate for Cesarean Section

	Residence		Service	
RHA	Numerator	Denominator	Numerator	Denominator
1	171	660	181	704
2	184	326	189	307
3	38	298	25	183
4	110	2,549	126	2805
5	72	199	64	126
6	409	951	415	933
7	152	457	112	347
8	71	345	17	104
9	23	110	21	86
10	755	3,640	1,018	4,692
11	122	343	72	136
12	175	564	139	373
13	152	448	152	446
14	59	132	74	147
15	80	175	50	90
16	108	257	103	262
17	29	107	6	60
Province	**2,710**	**11,561**	**2,764**	**11,801**

Table F15 Percent of Cesarean Sections Performed by General Surgeons or General Practitioners

	Residence	
RHA	**Numerator**	**Denominator**
1	153	972
2	95	474
3	227	489
4	32	6,162
5	61	378
6	210	1389
7	471	739
8	145	515
9	66	163
10	40	5,259
11	185	482
12	360	838
13	354	654
14	186	208
15	135	236
16	2	391
17	131	181
Province	**2,853**	**19,530**

Table F16 Unattempted Vaginal Birth After Cesarean Section (VBAC) Rate

	Residence		Service	
RHA	Numerator	Denominator	Numerator	Denominator
1	351	372	381	402
2	111	147	92	132
3	148	164	80	81
4	1,392	1,889	1,562	2,106
5	123	148	69	81
6	488	497	480	483
7	284	300	222	235
8	159	188	31	44
9	66	68	63	64
10	1,440	1,727	1,959	2,313
11	159	180	64	66
12	287	316	170	186
13	235	238	250	253
14	69	71	79	80
15	86	88	39	40
16	120	140	124	145
17	59	64	26	30
Province	**5,577**	**6,597**	**5,692**	**6,741**

Table F17 Maternal Post Vaginal Delivery Length of Stay Exceeding 48 Hours

	Residence		Service	
RHA	**Numerator**	**Denominator**	**Numerator**	**Denominator**
1	1,747	4,629	1,780	4,756
2	1,470	2,777	1,465	2,714
3	720	1,910	564	1,280
4	6,316	25,360	6,619	26,580
5	518	1,471	350	853
6	1,510	5,519	1,367	5,051
7	935	2,224	901	1,934
8	307	2,609	111	998
9	328	1,473	455	1,515
10	1,961	21,254	2,347	25,903
11	532	2,491	477	1,303
12	703	3,252	612	2,363
13	1,789	2,962	1,854	2,921
14	336	613	392	708
15	292	1,089	220	880
16	338	1,208	339	1,197
17	334	1,105	284	995
Province	**20,136**	**81,946**	**20,137**	**81,951**

Table F18 Percent of Newborns With a One Minute Apgar Score <7

	Residence		Service	
RHA	Numerator	Denominator	Numerator	Denominator
1	964	5,062	984	5,157
2	928	2,887	907	2,761
3	293	1,996	149	1,217
4	3,303	19,664	3,531	20,942
5	218	1,167	152	892
6	1,328	6,130	1,269	5,730
7	451	2,135	358	1,620
8	457	2,727	140	955
9	193	1,286	215	1,334
10	3,421	23,884	4,368	29,343
11	398	2,718	184	1,295
12	609	3,486	438	2,463
13	325	3,186	287	3,070
14	118	687	131	768
15	210	1,089	161	806
16	261	1,413	249	1,393
17	256	1,079	224	916
Province	**13,733**	**80,596**	**13,747**	**80,662**

Table F19 Potentially Preventable Newborn Readmission Rate

	Residence		Service	
RHA	Numerator	Denominator	Numerator	Denominator
1	125	4,629	131	4,756
2	76	2,777	74	2,714
3	79	1,910	40	1,280
4	701	25,360	764	26,580
5	66	1,471	41	853
6	232	5,520	168	5,052
7	99	2,226	75	1,936
8	89	2,609	44	998
9	63	1,473	112	1,515
10	727	21,255	949	25,903
11	121	2,491	64	1,303
12	171	3,253	114	2,365
13	136	2,962	127	2,921
14	23	613	28	708
15	62	1,089	47	880
16	34	1,208	32	1,197
17	36	1,105	30	995
Province	**2,840**	**81,951**	**2,840**	**81,956**

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